# PART 2: THE DECISION SUMMARY

A. SITE NAME, LOCATION AND DESCRIPTION

- Address
  Iron Horse Park
  High Street
  North Billerica, MA

- National Superfund electronic database identification number, e.g., CERCLIS identification number for Iron Horse Park is: MAD051787323

- The lead entity for Operable Unit 3 of Iron Horse Park is EPA

Site Description

The Iron Horse Park site, located in Billerica Massachusetts, is a 553-acre industrial complex which includes manufacturing and railyard maintenance facilities, open storage areas, landfills, and wastewater lagoons. A long history of activities at the site, beginning in 1913, has resulted in the contamination of soil, groundwater, and surface water. Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §§ 9601, *et seq.*, the site was listed on the National Priorities List (NPL) in 1984 and was subsequently divided into three operable units (OU). Although part of the same NPL listing, these three operable units are distinct areas of the Site. OU1, which consists of a former 15 acre wastewater lagoon area and OU2, a 60-acre landfill have both completed remedial action. The OU3 study area encompasses the rest of the site.

Operable Unit 3 is characterized by numerous source areas, an extensive wetland system, multiple property owners, a complex history and widespread environmental impacts. Due to the complicated nature of the original operable unit, OU3 was ultimately divided into two operable units. This Record of Decision (ROD) addresses the 7 Areas of Concern located within the original OU3. What is now defined as Operable Unit 3 will address Capping and Source Control measures which will be implemented to address potential sources of contamination, and are intended to prevent further spread of contamination to groundwater, surface water and sediment. The potential remediation of site wide surface water, sediment and groundwater will be addressed as a part of Operable Unit 4.

The source areas addressed are (See Figure 1-2):

**B&M Railroad Landfill** - A 14-acre landfill near the commuter rail line.

**RSI Landfill** - A 6-acre landfill adjacent to the rail yard.

**B&M Locomotive Shop Disposal Areas** - There are two disposal areas which total approximately 1and 3 acres in area. They are separated by a man-made channel.

**Old B&M Oil/Sludge Recycling Area** - Approximate 6-acre area was established sometime prior to 1938 for the purpose of recycling oil. It was filled in at a later date and until recently was primarily owned by the Penn Culvert Company.

**Contaminated Soils Area** - Approximate 50 acre area is located in the center of the Iron Horse Park Superfund Site.

**Asbestos Landfill** - Previously utilized by Johns-Manville for disposal of asbestos-related materials,13-acre landfill capped by EPA in 1984 as part of a removal action.

**Asbestos Lagoons** - Three unlined former asbestos lagoons on Johns-Manville (currently BNZ Materials) property which received an asbestos slurry pumped from the adjacent manufacturing operation. Asbestos from these lagoons was disposed of in the asbestos landfill.

A more complete description of the Site can be found in Section 1 of the Remedial Investigation Report.

## B. SITE HISTORY AND ENFORCEMENT ACTIVITIES

### 1. History of OU3 Activities

The 553 acres of land that now make up OU3 were first purchased by the B&M Railroad (now known as B&M Corporation) in 1911. Prior to that year, the Site consisted of approximately 18 privately owned parcels that B&M Corporation consolidated. Since 1911, a variety of industrial disposal practices have resulted in the creation of numerous lagoons, landfills, and open storage areas. At various times over the years, B&M Corporation has sold or leased several parcels of the land and some of the buildings on the Site to various companies. B&M operated an oil and sludge recycling area beginning sometime prior to 1938. This operation took place on property which was subsequently owned by Penn Culvert and currently, Cooperative Reserve Supply, Inc. In 1944, the B&M Railroad sold approximately 70 acres of land in the western portion of the Site to Johns-Manville Products Corporation, which at that time began to manufacture structural insulating board that contained asbestos. Three unlined lagoons were built to dispose of the resulting asbestos sludge waste. At approximately the same time, the B&M Railroad leased approximately 15 acres of land in the eastern portion of the Site to Johns-Manville to be used as a landfill for asbestos sludge and other asbestos mill wastes generated by their manufacturing operations. EPA capped this landfill in 1984 as part of an "Immediate Removal Action" under CERCLA. The B&M Landfill, the RSI Landfill, and the B&M Locomotive Shop Disposal Areas were unmonitored landfill/disposal operations.

A more detailed description of the Site history can be found in Section 1 of the Remedial Investigation Report.

2. History of Federal and State Investigations and Removal and Remedial Actions

| **Date** | **Action** | **Legal Authority** | **Who Undertook** | **Results** | **Related Documents** |
|---|---|---|---|---|---|
| 1984 | Time Critical Removal | CERCLA | EPA | Consolidation and capping of asbestos waste | Action Memorandum |
| 1987 | Site Investigation | CERCLA | EPA | Division of Iron Horse Park into operable units | Phase 1A Remedial Investigation |
| 1997 | Site Investigation | CERCLA | EPA | Risk Assessment | Remedial Investigation Final Report (OU3) |
| 2004 | Feasibility Study | CERCLA | EPA | | Proposed Plan |

3. History of CERCLA Enforcement Activities

On May 6, 2004, EPA notified five (5) potentially responsible parties (PRPs) who either owned or operated the facility, generated wastes that were shipped to the facility, arranged for the disposal of wastes at the facility, or transported wastes to the facility of their potential liability with respect to the Site. In addition, on May 13, 2004, EPA issued Potentially Interested Party (PIP) letters to ten (10) parties. Negotiations with the PRPs have not yet commenced regarding the settlement of the PRPs' liability at OU3.

The PRPs have been active in the remedy selection process for this Site. One PRP submitted comments on the Proposed Plan. The PRP comment letter (as well as other comments received during the comment period) is included in the Administrative Record. The comments are summarized and responded to in the Responsiveness Summary section of this ROD.

## C. COMMUNITY PARTICIPATION

Throughout the Site's history, community concern and involvement with OU3 has been moderate (historically the community has been most concerned and involved with OU2, Shaffer Landfill). EPA has kept the community and other interested parties apprized of OU3 activities through informational meetings, fact sheets, press releases and public meetings. Below is a brief chronology of public outreach efforts.

- In September and December of 1983, and March and August of 1984, EPA held meetings in Billerica regarding environmental sampling and the Asbestos Landfill.

- In August 1985, the EPA released a community relations plan that outlined a program to address community concerns and keep citizens informed about and involved in remedial activities.

- Local residents formed the Earthwatch Coalition to monitor Site activities. On September 29, 1993, they applied for a Technical Assistance Grant (TAG). The grant was awarded on March 4, 1994 and the Earthwatch Coalition retained a TAG consultant that has attended some technical project meetings.

- In November 1998, EPA issued a Fact Sheet which discussed the results of the Remedial Investigation and announced the upcoming informational meeting in Billerica.

- On December 1, 1998, EPA held an informational meeting in Billerica to discuss the results of the Remedial Investigation.

- On June 2, 2004, EPA made the administrative record available for public review at EPA's offices in Boston and at the Billerica Public Library, 15 Concord Road, Billerica. This was established as the primary information repository for local residents and has been kept up to date by EPA.

- EPA published a notice and brief analysis of the Proposed Plan on June 6, 2004 in the Lowell Sun and on June 10, 2004 in the Billerica Minuteman and made the plan available to the public at the Billerica Public Library, 15 Concord Road, Billerica.

- From June 16, 2004 to July 16, 2004, the Agency held a 30 day public comment period to accept public comment on the alternatives presented in the Feasibility Study and the Proposed Plan and on any other documents previously released to the public. An extension to the public comment period was requested and as a result, it was extended to August 13, 2004.

- On, June 16, 2004 EPA held an informational meeting to discuss the results of the Remedial Investigation and the cleanup alternatives presented in the Feasibility Study and to present the Agency's Proposed Plan to a broader community audience than those that had already been involved at the Site. At this meeting, representatives from EPA answered questions from the public.

- Also on June 16, 2004, the Agency held a public hearing to discuss the Proposed Plan and to accept any oral comments. A transcript of this meeting and the comments and the Agency's response to comments are included in the Responsiveness Summary, which is part of this Record of Decision.

## D. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

As with many Superfund sites, the problems at Iron Horse Park are complex. As a result, EPA has organized the work into 4 operable units (OUs):

• OU1: The **B&M Wastewater Lagoons** addressed contamination in an approximately 15 acre area, in and around the former wastewater lagoons. EPA selected a remedy for OU1 in a September 1988 ROD. The ROD selected bioremediation to address contamination in soil and sediment. This remedy was later modified to utilize off-site asphalt batching. The remedy for OU1 was completed in 2003 with an Remedial Action (RA) Report.

• OU2: The **Shaffer Landfill** addressed contamination at the 60 acre former mixed waste landfill. EPA selected a remedy for OU2 in a June 1991 ROD. The ROD selected capping and collection and disposal of leachate to address groundwater contamination. Construction of the remedy for OU2 was completed in 2003 with an Interim RA Report. OU2 is currently in the Operation and Maintenance phase.

• OU3: This ROD, for OU3, addresses the remaining, previously identified source areas within Iron Horse Park utilizing source control technologies to prevent direct contact with contaminants by human and ecological receptors and to prevent the spread of contamination to groundwater and surface water.

• OU4: During the OU3 Remedial Investigation and for most of the Feasibility Study (FS), it was intended that the OU3 ROD was to be the Final ROD for Iron Horse Park. During the FS, modeling was conducted on the alternatives being considered to address groundwater contamination. According to the modeling results, none of the remedial measures would have achieved cleanup requirements in a reasonable time period (modeling generally predicted in excess of 200 years). Groundwater will be re-evaluated as to whether further characterization is required or whether other measures are necessary in order to address site-wide groundwater in the ROD for OU4

With regard to surface water and sediment, site-specific toxicity data has not been previously collected for these media. EPA feels that the lack of this data, prevents a high enough degree of confidence in ecological risk conclusions to be able to choose a remedy at this time. Therefore, the site-specific toxicity data will be collected and incorporated into an amended risk assessment and remedy decisions for surface water and sediment will be included in the ROD for OU4.

The selected response action for OU3 addresses low-level threat wastes by eliminating exposure to human and ecological receptors from contaminated soil and airborne asbestos. This is accomplished through source control actions at the affected AOCs (capping of landfills and contaminated soil areas). In addition, the source control actions will help eliminate the ongoing migration of contaminants from the source areas to groundwater or surface water. There are no principal threat wastes at OU3.

## E. SITE CHARACTERISTICS

Section 1 of the Final Feasibility Study of May 2004 contains an overview of the Remedial Investigation. The significant findings of the Remedial Investigation are summarized below.

The 553 acres of land that comprise the Site ( Figure 1-2) were first purchased by the B&M Railroad (now known as B&M Corporation) in 1911. Prior to that year, the Site consisted of approximately 18 privately owned parcels that B&M Corporation consolidated. Land-use records for these parcels prior to 1911 were not recorded. However, since 1911, a variety of industrial disposal practices have resulted in the creation of numerous lagoons, landfills, and open storage areas. Table 1-1 of the May 2004 FS Report provides a chronology of the activities at the Site.

As a result of the Phase 1A RI completed in 1987, areas of concern identified at the Site were divided into three operable units: the B&M Wastewater Lagoons (operable unit 1), the Shaffer Landfill (operable unit 2), and the remaining areas of concern (operable unit 3) including the B&M Railroad Landfill, B&M Locomotive Shop Disposal Areas (A and B), the Reclamation Services Inc. (RSI) Landfill, the Old B&M Oil/Sludge Recycling Area, the Contaminated Soils Area, the Asbestos Landfill, the Asbestos Lagoons, and Site-Wide Surface Water and Sediment Contamination. Operable unit 3 is addressed in the May 2004 FS Report. Selected surface water and sediment locations are being evaluated to further determine potential ecological effects as part of operable unit 4.

The area of study evaluated during the RI included not only the applicable portions of the Site, but also surrounding areas and water bodies that are potentially affected by operable unit 3 (the 3rd operable unit). For this reason, the entire study area evaluated during the RI is referred to throughout this report as "the Site." The area of study that was evaluated during the Remedial Investigation is shown in Figure 1-1.

Areas of concern (AOCs) in OU3 consist of the B&M Railroad Landfill, the B&M Shop Disposal Areas (A and B), the RSI Landfill, the Old B&M Oil/Sludge Recycling Area, the Contaminated Soils Area, and the asbestos contamination areas (including the Asbestos Landfill and the Asbestos Lagoons). Surface water and sediment contamination by wetland group (West Middlesex, Wetland 2, East Middlesex, Richardson Pond, and Content Brook) will be addressed in OU4. The media of concern in OU3 is surface and subsurface soil, while groundwater, surface water, and sediment will be the media of concern in OU4. Contaminants detected most frequently on site included volatiles, semi-volatiles, pesticides, polychlorinated biphenyls (PCBs), asbestos, and metals.

**Waste Disposal Practices and Contaminant Sources by Area of Concern**

**B&M Railroad Landfill.** The B&M Railroad landfill is approximately 14 acres in size and is located in a wetland area, north of the Middlesex Canal and east of the rail yard. The wetland was filled in by the B&M Railroad and used to dispose of various kinds of debris. Partially buried drums and railroad ties with creosote have been observed in this area.

**RSI Landfill.** The 6-acre RSI Landfill, located east of the B&M rail yard near the Johns-Manville Asbestos Landfill, is bounded on the south by an unnamed brook and on the east by a wetland, which the Middlesex Canal drains. This area was used by B&M as a borrow pit for sand and gravel sometime between 1961 and 1969.

From June of 1971 until August of 1971, the Massachusetts Division of Environmental Health granted RSI permission to use the B&M land to dispose of its loose, burnt refuse. The waste disposed of by RSI on B&M land was classified as municipal and light industrial solid wastes from the cities of Cambridge and Somerville.

**B&M Locomotive Shop Disposal Areas.** The B&M Locomotive Shop Disposal Areas consist of two disposal areas separated by a manmade channel that flows into an unnamed brook. The first area, located on the north side of the channel and approximately 1 acre in size is referred to as Area A.

The second area located on the south side of the channels is approximately 3 acres in size and is referred to as Area B. Prior to 1938 and until about 1979, Area B was used to dispose of various kinds of "light and dark-toned materials." Various kinds of debris, including deteriorated drums have been observed in this area.

**Old B&M Oil/Sludge Recycling Area.** The 6-acre, Old B&M Oil/Sludge Recycling Area was established sometime prior to 1938 for the purpose of recycling oil. A B&M Railroad site plan, dated 1972, shows two adjacent areas designated as "oil and sludge" which appear to be located about 300 feet west of the B&M locomotive shop repair facility. These two areas, where the oil and sludge pooled, had a combined dimension of 600 by 200 feet. In 1973, the Penn Culvert Company purchased the parcel of land containing these two disposal areas and sometime later filled them in.

**Contaminated Soils Area.** The Contaminated Soils Area is located in the center of the Iron

Horse Park Superfund Site and is approximately 50 acres in size. The Contaminated Soils Area encompasses properties owned by Eastern Terminals, Inc., Wood Fabricators, and the Massachusetts Bay Transportation Authority (MBTA) (Figure 1-3).

Contaminated soil was first identified as a problem in the central portion of the Iron Horse Park Superfund Site after a random soil boring program conducted across the Site indicated elevated levels of lead (310 to 76,600 ppm) at nine out of forty locations.

**Asbestos Landfill.** The Site has historically been identified with asbestos contamination due to asbestos landfilling operations conducted by Johns-Manville over a 32-year period. Although EPA capped the Asbestos Landfill in 1984, "asbestos contamination" was identified as a potential operable unit because the cap was not maintained. The integrity of the cap was evaluated as part of the RI. The entire western boundary of the cap is not fenced.

In 1985, during the Phase 1A RI, surficial soils (0 to 3 inches) from 40 random boring locations were analyzed for the presence of asbestos. Asbestos was detected at 28 of the locations sampled and, at eight of these located on Johns-Manville (currently BNZ Materials), Penn Culvert, and B&M properties, asbestos was present at levels greater than 1%. This suggested that wind-blown deposition of asbestos had occurred in portions of the Site on B&M property adjacent to the landfill, as well as on Johns-Manville (currently BNZ Materials) property where the asbestos waste originated. These sample results outside BNZ Materials property, are sporadic in nature, and with two exceptions, the results are either non-detect for asbestos, or contain less than 1% asbestos. These results do not suggest a pattern of asbestos contamination outside of the BNZ Materials property.

An off-site soil sampling program was also conducted to determine the extent, if any, of wind-blown asbestos in residential areas bordering the Site. The results of the off-site soil sampling indicated that, with one exception, there were no detectable levels of asbestos in these residential areas and the Draft Phase 1A RI report, concluded that deposition of wind-blown asbestos from the Site on off-site areas most likely did not occur.

The Asbestos Landfill Cap Evaluation Report was submitted to EPA in February 1994. This report documents the evaluation of the current condition of the landfill cap surface and recommends corrective actions to be implemented to protect public health and comply with state and federal regulations.

**Asbestos Lagoons.** In addition to the Asbestos Landfill, there are three unlined asbestos lagoons on Johns-Manville (currently BNZ Materials) property. One of these lagoons has been filled and covered. When the lagoons were operated by Johns-Manville, they received an asbestos slurry pumped from the adjacent manufacturing operations. Asbestos from these lagoons was disposed of in the Asbestos Landfill; however, the lagoons still contain some asbestos, as well as other wastes.

The lagoons continued to receive wastewater from Johns-Manville operations after asbestos manufacturing operations closed. While this discharge allegedly did not contain asbestos, it may have contained some other hazardous substances. During the Remedial Investigation xylenes, toluene, manganese and other contaminants were detected in Asbestos Lagoons sediments.

**Site-Wide Surface Water and Sediment Contamination.** The Middlesex Canal, as well as several ponds, wetlands, and streams (which will be addressed under OU 4) flow through and are adjacent to the OU3 areas of concern at the Site. Potential contamination of surface water and sediment as a result of surface runoff and groundwater contamination migration and discharge are of concern and are addressed under source control provisions within the OU3 remedy.

The quantity/volume of waste that may need to be addressed by media and disposal area are presented in Table 2-12 of the May 2004 Feasibility Study Report.

**<u>Geographic Setting</u>**

The Site is located in North Billerica, Massachusetts, approximately 8 miles south of the New Hampshire border, at an elevation of about 115 feet above sea level.

Located in eastern Massachusetts, the Site is on the western side of the Seaboard Lowland section of the New England physiographic province, a subdivision of the Appalachian Highlands. The Seaboard Lowlands are characterized by extensive glacial outwash and till deposits overlying a complex of igneous and metamorphic rocks.

The Site lies on the western edge of the Shawsheen River drainage basin and is approximately 1.5 miles from the northward-flowing Shawsheen River. The Iron Horse Park Superfund Site is surrounded by upland areas on the southeast side, including several small forested hills near Pond Street, and low lying wetland areas on the western, northern, and northeastern side of the Site. Currently, 17% of the Site is characterized as wetlands.

Soils on and in the immediate vicinity of the Site are classified as predominantly urban land with other soil types to a lesser extent. Urban land is indicated in areas where the soil has been disturbed or altered, is obscured by cultural features (*e.g.*, buildings, industrial areas, roads, rail yards) and where these features cover more than 75% of the surface area.

The Site is used for industrial purposes, with no residential use. Some parts of the Site are fenced, but most is accessible to passers-by. The area within one mile of the Site boundary is primarily forest and residential, consisting primarily of single-family residential properties.

Surface waters in the vicinity of the Shaffer Landfill (OU2) on the Site are classified as Class B waters by the Commonwealth of Massachusetts and are designated for use as warm water fisheries and contact recreation. The Middlesex Canal, linking the Merrimack River to the Boston basin, runs through the Site, and some of its original features remain. It is essentially impassable for recreation or economic purposes. Histories of the canal indicate that clay was used along the canal banks to limit seepage of the canal water into neighboring lowlands. However, use of the clay liner in the canal may have been limited in extent.

A town inventory of historical properties revealed two historical assets within the site boundaries. The Small Pox Cemetery, dating back to 1811, is located between the Middlesex Canal and the MBTA commuter railroad line. The Content Brook Mill is located at the eastern end of the Shaffer Landfill property.

Files on five historic locations within or adjacent to the Site are maintained by the Massachusetts Historical Commission (MHC). These include the Pond Street Bridge over the B&M Railroad at the Site boundary (inventoried as BIL.917), the Middlesex Canal (BIL 934, BIL K and BIL P), the B&M Railroad Billerica Shop Complex (BIL.299), the Equipment Storage Shed (BIL.300), the Maintenance Shed (BIL.301), and the Power Plant (BIL. 302), the last four being centrally located on the Site.

As shown in Figure 1-4, part of the Site overlies what is expected to be a medium-yield aquifer. The remainder is expected to be a low-yield aquifer. No public water supply sources are located within the medium-yield aquifer on the Site, but the groundwater beneath the medium-yield aquifer is considered a potential drinking water source by both EPA and the Commonwealth of Massachusetts.

Although not currently in use, community public water supply wells are located less than 1 mile east of the Site in Tewksbury. The ½-mile-radius Interim Wellhead Protection Area (IWPA) for one of the Tewksbury wells extends to within approximately 500 feet of the Site on the northeast side. Surface water and other groundwater community public water supplies are located at North Billerica on the Concord River, just north of the Route 3A bridge, where a filtration plant is located. The southwestern corner of the Site is close to the ½-mile IWPA for the North Billerica Well. However, like the Tewksbury wells, this well is not currently in use.

There may be private wells along Gray Street, which is east of the Shaffer Landfill section of the Site, based on the knowledge of personnel at the Billerica Health Department. It is not known whether any such private wells are used as sources of drinking water or for other domestic uses.

**Geology**

Bedrock underlying the Site is comprised of granite, schist, and diorite. Bedrock surface elevations suggest the presence of a trough in the bedrock surface trending northeast from the Old B&M Oil/Sludge Recycling Area to the Unnamed Brook, then northwest toward the Asbestos Lagoons. Bedrock fractures were found trending north-northeast and east-west.

The overburden primarily consists of glacial drift deposits including basal and ablation till and glacial outwash deposits. Basal till was found primarily on the southwestern portion of the Site, and ablation till was found primarily in the western and southern portion of the Site overlying basal till. Glacial outwash deposits were encountered throughout the Site. Peat deposits were encountered underlying fill materials near streams, ponds, and wetlands at the Site.

## Hydrogeology

The overburden aquifer was subdivided into shallow and deep zones to aid in determining the potential migration pathways. Groundwater is also contained and transmitted in weathered and fractured bedrock zones. Groundwater in both the overburden and bedrock aquifers generally enters the Site from the southwest and flows to the northeast. Similarly, surface water flows onto the Site from the south and flows to the northeast, where it converges with B&M Pond and associated wetlands. Based on seepage meter, staff gauge, and mini-piezometer results, the potential for groundwater to discharge to surface water was evident throughout most of the Site. Vertical gradients measured throughout the site indicates groundwater movement is much more horizontal than vertical.

## Remedial Investigation Sampling Strategy

**Immediate Removal Sampling.** On- and off-site sampling for asbestos was conducted associated with the immediate removal action which resulted in the cover being placed on the Asbestos Landfill in 1984. While off-site impacts were not indicated, on-site sampling documented significant asbestos containing material and aided in the consolidation of material prior to capping.

The Remedial Investigation sampling program included the sampling of surface soil, subsurface soil (test pits and borehole soil), surface water, sediment and (shallow overburden, deep overburden, and bedrock) throughout the Site.

**Surface soils.** A total of 79 surface soils including background and historical locations were collected throughout the Site from July 22 through September 5, 1993 at locations presented in Figure 2-12 of the September 1997 RI Report. Five samples collected over a one acre area were composited and analyzed for volatile organic compounds (VOCs), semivolatile organic complounds (SVOCs), pesticides/PCBs, metals, cyanide, total petroleum hydrocarbons (TPH), total combustible organics (TCO), and moisture content.

**Test Pits.** Twenty seven test pits were excavated in the B&M Railroad Landfill, RSI Landfill, B&M Shop Disposal Area, and the Old B&M Oil/Sludge Recycling Area from August 16 to 24, 1993 at locations shown in Figures 2-7 to 2-9 of the September 1997 RI Report. Soil samples were analyzed for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, and TPH. Test pit locations were selected in potential source areas based on results of the geophyiscal surveys.

**Soil borings.** A total of 46 soil borings were advanced in the B&M Railroad Landfill, RSI Landfill, B&M Shop Disposal Area, and the Old B&M Oil/Sludge Recycling Area from August

24, to September 3, 1993 at locations shown in Figures 2-7 to 2-10 of the September 1997 RI Report. Soil samples were analyzed for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, TPH, TCO, and grain size. Boring locations were selected in potential source areas based on results of the geophyiscal surveys.

**Surface water and Sediment Sampling.** Forty six surface water and sediment samples were collected across the Site and study area during periods of high and low flow from June 9 through 22, 1993 and September 14 to 22, 1993 as shown in Figure 2-6 of the September 1997 RI Report. Surface water samples were analyzed for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, TOC, and alkalinity samples and sediment samples were analyzed for VOCs, SVOCs, pesticide/PCBs, metals, cyanide, TPH, TCO, moisture content, and grain size.

**Groundwater Samples.** Fifty groundwater screening samples were collected from shallow groundwater downgradient of suspected source areas and measured by field GC for chlorinated and aromatic VOCs from September 27 through October 8, 1993 to assist in the location of monitoring wells. Groundwater samples were collected from monitoring wells screened in shallow overburden, deep overburden, and bedrock during the RI. A total of 77 monitoring wells shown on Figure 2-13 of the September 1997 RI Report were sampled during each of two rounds: March 28 to April 10, 1995 and July 17 to 28, 1995. The strategy included sampling wells upgradient, downgradient, and in the vicinity of source areas in which groundwater contamination was of concern. These areas included: the B&M Railroad Landfill, the RSI Landfill, the B&M Shop Disposal Area, the Old B&M Oil/Sludge Recycling Area, and the Asbestos Lagoons.

The Conceptual Site Model (CSM) for groundwater, surface water, and sediment is provided in Figure E-1 and the CSM for soil is provided in Figure E-2. The CSM is a three-dimensional "picture" of site conditions that illustrates contaminant sources, release mechanisms, exposure path ways, migration routes, and potential human and ecological receptors. It documents current and potential future site conditions and shows what is known about human and environmental exposure through contaminant release and migration to potential receptors. The risk assessment and response action for the media at OU3 is based on this CSM.

## Nature and Extent of Contamination

The distribution of contaminants by media and area of concern, as well as contaminant fate and transport, are described in the following sections. The Asbestos Landfill has been omitted, since analytical samples were not collected in that area during the Remedial Investigation. (Note: Confirmatory sampling of asbestos to aid in efforts to consolidate the landfill prior to capping, was conducted during the immediate removal in 1984)

The concentration ranges of detected compounds for samples collected by area, media and analyte group are presented in detail in the Section 4 text and tables of the September 1997 Final RI Report. The quantity/volume of waste by media and disposal area that need to be addressed are presented in Table 2-12 of the 2004 Feasibility Study Report.

**B&M Railroad Landfill.** Similar types of organic compounds including VOCs, PAHs, phthalates, petroleum hydrocarbons, and pesticides were detected in surface and subsurface soils, with the highest concentrations occurring in subsurface soils. These contaminants were also present in lower concentrations in groundwater. Heavy metal concentrations in surface and subsurface soils were higher than background soils. For soils, the southeastern half of the landfill was more contaminated with both organic compounds and metals. High concentrations of PCBs in subsurface soils suggest that PCB-contaminated material, possibly oils, was disposed of. Aromatic VOCs, PAHs and petroleum hydrocarbons are indicative of petroleum-related products that probably include coal tar and creosote waste.

In groundwater, wells located in the vicinity of the landfill exhibited the highest concentrations of contaminants, especially organic compounds. Aromatic and chlorinated VOCs, PAHs, pesticides, PCBs, and elevated metal concentrations were measured in groundwater, but were present in lower concentrations than in soil. Although no non-aqueous phase liquids (NAPLs) were found, oily sands were observed at several depths; in conjunction with the types of organic compounds that were detected, this suggests the presence of NAPL. Degradation of trichloroethylene (TCE) is evidenced by the presence of its potential byproducts, including both isomers of dichloroethylene (DCE).

**RSI Landfill.** Waste and fill present in the west-central portion of the landfill include organic compounds and heavy metals, detected in subsurface soils, and pesticides, PCBs, and phthalates, found in subsurface and surface soils. Aromatic VOCs, pesticides, and PCBs were detected in groundwater at low concentrations. The detection of chlorinated VOCs in upgradient, as well as downgradient and vicinity wells, indicates that upgradient sources may be affecting groundwater quality. The presence of elevated vinyl chloride and dichlorinated VOCs directly downgradient of landfilled wastes and near the water table (groundwater screening locations) are indicative of the degradation of chlorinated VOCs. Aromatic VOCs found in a groundwater cluster near the Asbestos Landfill and the RSI Landfill may be from the Asbestos Landfill. The basis for this statement is: these wells are located immediately downgradient of the Asbestos Landfill, the contaminant concentrations in these wells were consistent between sampling rounds, and concentrations of aromatic compounds at the levels detected in these downgradient wells were not found elsewhere on-site.

**B&M Locomotive Shop Disposal Areas.** Heavy metals and organic compounds including pesticides, PAHs, and petroleum hydrocarbons were detected in surface and subsurface soils in both areas, where waste or fill material was found. A few organic compounds (including one VOC, a few pesticides, and one PCB Aroclor) and heavy metals were detected in groundwater in the downgradient and vicinity wells. The detection of organic compounds and some heavy metals in the upgradient cluster indicate that other sources may be present in the vicinity. Mercury and copper were the only detected metals that were not found in the upgradient wells.

**Old B&M Oil/Sludge Recycling Area.** Two areas of oil/sludge, located on the northern and southern edges of the area, were found to extend beyond the Penn Culvert fence perimeter, with one area extending onto MBTA property. The predominant types of organic compounds found were consistent with the oil/sludge reportedly disposed of in these areas. Contaminants detected in surface and subsurface soils consist primarily of PAHs, long-chain alkanes, and petroleum hydrocarbons. Numerous pesticides and PCBs were detected in the northern area, and heavy metals were measured in both areas. Although aromatic VOCs, PAHs, and petroleum hydrocarbons were generally not present in groundwater, chlorinated VOCs and heavy metals were detected. Heavy metals, which were detected primarily in shallow overburden groundwater, include arsenic, chromium, cobalt, lead, mercury, nickel, and zinc. Petroleum hydrocarbons were measured in one well, and several inches of floating product were observed in one piezometer in the southern oil/sludge area.

**Contaminated Soils Area.** Since surface soil contamination was of key concern in this area, this was the only medium sampled. However, groundwater monitoring wells associated with other AOCs are also downgradient of the **Contaminated Soils Area.** Organic compounds, including PAHs, petroleum hydrocarbons, and pesticides, were measured in surface soils in localized areas. Lead and manganese were the heavy metals that were detected most often and in the highest concentrations. Cyanide was detected in a localized area along the southeastern boundary.

**Asbestos Lagoons.** Sediment soil samples were collected at these lagoons during the RI. Groundwater contaminants included VOCs (primarily aromatic and chlorinated VOCs), PAHs, PCBs and pesticides. Several of the chlorinated VOCs (perchloroethylene (PCE), trichloroethane (TCA), and dichloroethane (DCA)) and heavy metals (arsenic, cobalt, lead, and zinc) were detected in the shallow overburden, deep overburden and bedrock flow zones. The types of contaminants found were similar to those detected in the 1980s during investigations related to the Johns-Manville stormwater drainage system. Detected heavy metals and organic compounds were primarily found in downgradient wells near the lagoons.

<u>**Contaminant Fate and Transport**</u>

In the following sections, contaminant fate and transport are described by area of concern. In general contamination at the Site consists of low level threat wastes.

**B&M Railroad Landfill.** Since organic materials are prevalent in soils, PCBs, PAHs, and pesticides are not expected to migrate appreciably in the unsaturated zone. It is also expected that the mobility of metals will be limited due to adsorption and other processes in soil. A migration pathway for VOCs in the unsaturated zone may be via vapor phase, since VOCs were detected more often at the water table (in groundwater screening locations) than with depth below it.

With the exception of VOCs, most contaminants found in the saturated zone soils (pesticides, PCBs, PAHs, phthalates, and heavy metals) will not migrate significantly in the dissolved phase as evidenced by the groundwater quality in wells across from B&M Pond. The presence of PCBs and pesticides below the limits of the waste indicate that residual or pooled dense non-aqueous phase liquids (DNAPL) may be present, although none was observed. Groundwater levels and analytical data indicate that groundwater is migrating vertically. Contaminants in the dissolved phase may migrate from the landfill to the B&M Pond to the east and the Middlesex Canal to the south as evidenced by downgradient contamination.

Measured vertical gradients indicate groundwater discharges to the Middlesex Canal and B&M Pond. Contaminants are more prevalent in sediment than surface water due to attenuation processes. Contaminants detected in sediments were also found in upgradient reaches. PCBs in the Middlesex Canal may be a result of historic discharges from the stormwater drainage system at the former Johns-Mansville facility.

**RSI Landfill.** Borings indicate that wastes exist above and below the water table. The absence of a low-permeability cover allows for contaminant transport from the unsaturated to the saturated zone. Similar to the B&M Railroad landfill, relatively elevated concentrations of PCBs, PAHs, and phthalates are found in the unsaturated zone. These compounds in percolating water may be highly attenuated through adsorption to organic matter in the soils. Although these compounds may also migrate vertically in DNAPL form, no DNAPL was observed. Most metals are fairly immobile due to adsorption and low solubility; however, leaching is possible. Chlorinated VOCs (DCE and vinyl chloride) detected in groundwater screening samples indicate the partitioning of these compounds to the vapor phase. Therefore, vapor phase movement may be a prominent transport mechanism at the water table.

Most organic compounds with the exception of VOCs often do not migrate significantly in the dissolved phase. Pesticides, PAHs, phthalates, and PCBs adsorb to organic matter in soils. However, due to the presence of sandy soils with less organic material, contaminant transport is of greater concern. Based on the direction of groundwater flow, contaminants in the dissolved phase would likely migrate toward the Middlesex Canal to the northeast and the unnamed brook to the southeast. Although vertical gradients are low, the existence of shallow bedrock facilitates contaminant transport from the overburden to bedrock. The presence of pesticides and PCBs in the deep overburden and bedrock groundwater indicates the potential for localized DNAPL pools; however, this was not confirmed during the field activities.

**B&M Locomotive Shop Disposal Areas.** Borings indicate that wastes exist above and below the water table. PAHs were found in the highest concentrations, especially in subsurface soils, while pesticides, PCBs, VOCs, and petroleum hydrocarbons were found at lower concentrations. The absence of a low-permeability cover facilitates contaminant transport from the unsaturated to the saturated zone. However, pesticides, PCBs and PAHs in percolating water may be highly attenuated through adsorption to organic matter in the soils.

Aromatic VOCs, PAHs, and petroleum hydrocarbons were notably absent in groundwater, although they were prevalent in subsurface soils. The absence of PAHs may be attributed to adsorption to soils. The absence of aromatic VOCs and petroleum hydrocarbons may be due to the placement of well screens below the water table. The potential for biodegradation of chlorinated compounds is evidenced by the existence of the breakdown products DCE and vinyl chloride near the water table. Based on the direction of groundwater flow, contaminants in the dissolved phase from both areas will migrate toward the northeast with potential downgradient discharge to the unnamed brook. Although vertical hydraulic gradients tend to be downward, there is no evidence that vertical migration of contaminants has occurred at this point.

**Old B&M Oil/Sludge Recycling Area.** Subsurface soils exhibited the highest concentrations of contaminants including aromatic VOCs (BTEX compounds - benzene, toluene, ethylbenzene, xylenes), PAHs, petroleum hydrocarbons, and metals. Although some of the area is covered with asphalt, the absence of a low-permeability cover may facilitate contaminant transport to the saturated zone (especially VOCs). However, PAHs, pesticides, and metals will tend to adsorb to the organic matter (peat) prevalent in soils in this area. Based on observations of free product in the area and the occurrence of PAHs and petroleum hydrocarbons, light non-aqueous phase liquids (LNAPL) in residual or mobile form may be widespread. It was not detected in wells most likely because they are screened as much as 1 foot or more below the water table. The presence of high concentrations of PAHs may also indicate the presence of DNAPL.

**Contaminated Soils Area.** Soil contamination is likely the result of surface discharge from various work-related activities and is probably limited to surface soils. Evidence of free product spills included visual observation of oil-soaked or stained soils. Elevated levels of lead were detected throughout the area. Since lead is relatively insoluble and strongly adsorbed, significant migration in the unsaturated zone is not expected.

Pesticides, PAHs, VOCs, and heavy metals (especially lead) were measured in sediment at nearby water bodies. Overland flow runoff is the most likely transport pathway for this area. Based on drainage patterns to the northeast, this area could be contributing to contaminants in surface water and sediments in the Middlesex Canal, the unnamed brook, wetlands and ponds in the vicinity, as well as drainage ditches that lead to these water bodies.

**Asbestos Lagoons.** The limits of waste relative to the water table were not defined, since drilling was not conducted within the lagoons. The predominant types of compounds found in groundwater include pesticides and PAHs, which are likely to be strongly adsorbed to soils. Concentrations of several metals were elevated, with calcium levels most elevated. This was to be expected due to the plasterboard materials that were disposed here.

Several metals, a few chlorinated VOCs, and PAHs were most prevalent in the deep overburden and bedrock groundwater. PCBs were detected in a shallow well adjacent to catch basins. Past wastewater discharges, stormwater drain leakages, and mounding caused by rainfall likely induced vertical migration of contaminants beneath the area. Low concentrations of pesticides in groundwater may be the result of percolating rainwater. Chlorinated VOCs are likely the most mobile contaminants. Groundwater flow is divided, with flow to the northwest toward

Middlesex Canal and to the northeast. Vertical gradients tend to be downward from shallow to deep overburden near the lagoons, but upward from bedrock to shallow overburden at the downgradient wells.

Summary of Exposure Pathways and Receptors

**Human Health.** Surface soil exposures to human receptors were evaluated for five AOCs: B&M Railroad Landfill, RSI Landfill, B&M Locomotive Shop Disposal Areas, Old B&M Oil/Sludge Recycling Area, and Contaminated Soils Area. Subsurface soil exposures at the Old B&M Oil/Sludge Recycling Area were also addressed.

Human receptors were identified as current and future adult workers based on the current active industrial use of the Site. It was assumed that future land use will remain the same as current land use. Worker exposures to soil were assumed to occur. Because the Site is not completely secure, child/teenage trespassers were assumed to gain access to the Site currently and in the future. Trespassers were assumed to contact on-site soil along with sediment and surface water in the wetland and ponds associated with the Site. Area residents are not currently using groundwater impacted by the Site for potable purposes. However, residential groundwater use was evaluated as a future exposure medium. The following summarizes the exposure pathways evaluated for each of the identified receptor populations:

- Site adult worker, current and future
  Ingestion pathways: surface soil
  Dermal contact pathways: surface soil

- Site child/teenage trespasser, current and future
  Ingestion pathways: surface soil,
  Dermal contact pathways: surface soil,

Trespassers and workers potentially may be chronically exposed to asbestos fibers released from the Asbestos Lagoons as well as at the Asbestos Landfill, if the landfill cap is not maintained.

Effects on the lung resulting from inhalation of asbestos fibers is the major asbestos health concern. Chronic inhalation exposure to asbestos can result in a lung disease termed asbestosis which is characterized by shortness of breath and cough. Asbestosis may lead to severe impairment of respiratory function and ultimately death. Other effects include scarring of tissue surrounding the lungs. pulmonary hypertension and immunological effects. Inhalation of asbestos fibers can cause lung cancer and mesothelioma (a rare cancer of the thin membranes lining the abdominal cavity and surrounding internal organs).

Asbestos fibers in the Lagoons, have the potential to become airborne, posing a human health threat via the inhalation pathway. Disposal of asbestos in these lagoons as well as subsequent partial removal has been documented. Furthermore, sampling of material in the lagoons confirms the presence of asbestos.

Under the National Emissions Standards for Hazardous Air Pollutants (NESHAP), in 1973 EPA defined asbestos containing material as material containing 1% asbestos or greater based detection limits available at the time. More recent data demonstrates that materials containing less than 1% asbestos may also pose a potential health risk in some circumstances.

As discussed earlier, a random soil sampling effort was conducted as part of the Phase 1A RI to analyze for asbestos. Asbestos was detected at a number of locations outside of the BNZ Materials property. These sample results outside BNZ Materials property, are sporadic in nature, and with two exceptions, the results are either non-detect for asbestos, or contain less than 1% asbestos. These results do not suggest a pattern of asbestos contamination outside of the BNZ Materials property indicative of a release to be remediated.

**Ecological.** Soil exposures were evaluated for ecological receptor populations within seven distinct areas of concern (AOCs): Asbestos Lagoons, Old B&M Oil/Sludge Recycling Area, Contaminated Soils Area, B&M Railroad Landfill, B&M Locomotive Shop Disposal Areas, RSI Landfill, and site-wide surface water and sediment. The risk posed by exposure to contaminants in surface water and sediment will be further addressed by Operable Unit 4 of the Iron Horse Park Superfund Site. Two AOCs including the Asbestos Lagoons and the site-wide surface water and sediment focused on exposures to aquatic and semi-aquatic species to surface water and sediments. Consequently, this section focuses on the ecological exposure to soils at five AOCs: Old B&M Oil/Sludge Recycling Area, Contaminated Soils Area, B&M Railroad Landfill, B&M Locomotive Shop Disposal Areas, and RSI Landfill.

Terrestrial receptors species and exposure pathways evaluated included:

- earthworm (soil invertebrates)
  - Dermal absorption
  - Ingestion of contaminated soil, detritus, and animal matter
- short tail shrew (small terrestrial mammals)
  - Consumption of soil invertebrates
  - Incidental ingestion of soil and surface water
  - Ingestion of surface water

The Contaminated Soils Area and the Old B&M Oil/Sludge Recycling Area were not quantitatively evaluated because a qualitative evaluation indicated the lack of significant receptor populations. Habitat in both of these areas is limited, as is the total area over which significant populations of earthworms and other soil invertebrate would be expected. Without a substantial prey base, shrews would not be expected to use these areas extensively.

It should be noted that contaminants associated with the Contaminated Soils Area and the Old B&M Oil/Sludge Recycling Area that could be transported were included in the sediment and surface water sampling program for adjacent and downgradient areas. Impacts to ecological receptor populations exposed to surface water and sediment contamination will be addressed as part of Iron Horse Park Operable Unit 4.

## F. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

The land associated with OU3 is used for industrial purposes, with no residential use. The Middlesex Canal is essentially impassable for recreation or economic purposes, although it is a historic structure that someday could be developed as parkland or utilized as a resource in some other manner. Some parts of OU3 are fenced, but most is accessible to passers-by. The area within one mile of OU3 boundary is primarily forest and residential, consisting primarily of single-family residential properties.

The town zoning map indicates that aside from a small section of commercially zoned land toward the southwest corner, the Iron Horse Park Site is zoned industrial. Consultation with the Billerica Planning Board and MADEP indicated that future land use is expected to remain industrial. The industrial zoning extends beyond the boundary of Iron Horse Park. In addition, the immediate surrounding area consists of rural residence and neighborhood residence zoning categories with a few small areas of general business zoning.

- Ground/Surface Water Uses:

Massachusetts GIS has mapped water related resources in Massachusetts, including in the area around the Iron Horse Park Site (Figure F-1). Part of the Site overlies what is classified as a medium-yield aquifer. Due to the presence of a railyard over a portion of this aquifer, the Massachusetts Department of Environmental Protection reclassified most of this aquifer as a non-potential drinking water source and considered of low use and value. However, the portion of the aquifer without the railyard remains a potential drinking water source, and is considered of medium use and value. The remainder of the Site overlies what is expected to be a low-yield aquifer. No public water supply sources are located within the medium-yield aquifer on the Site.

The current use(s) of the surface water at the Site and surrounding areas is as a warm water fishery and for contact recreation. On Site contact recreation would primarily be by trespassers.

Community and stakeholder input was sought and incorporated through active outreach with the Billerica Planning Board.

## G. SUMMARY OF SITE RISKS

A baseline risk assessment was performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the Site assuming no remedial action was taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The human health risk assessment followed a four step process: 1) hazard identification, which identified those hazardous substances which, given the specifics of the site were of significant concern; 2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; 3) toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances, and 4) risk characterization and uncertainty analysis, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the site, including carcinogenic and non-carcinogenic risks and a discussion of the uncertainty in the risk estimates. A summary of those aspects of the human health risk assessment which support the need for remedial action is discussed below followed by a summary of the environmental risk assessment.

### 1. Human Health Risk Assessment

Fifty of the more than 110 chemicals detected at the site were selected for evaluation in the human health risk assessment as chemicals of potential concern. The chemicals of potential concern were selected to represent potential site related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment and can be found in Tables 6-11 through 6-14 of the RI and in Table 2 of Appendix I to the FS. From this, a subset of the chemicals were identified in the Feasibility Study as presenting a significant current or future risk and are referred to as the chemicals of concern in this ROD and summarized in Tables G-1 through G-3 for surface soil, surface soil/subsurface soil, and groundwater, respectively. These tables contain the exposure point concentrations used to evaluate the reasonable maximum exposure (RME) scenario in the baseline risk assessment for the chemicals of concern. Estimates of average or central tendency exposure concentrations for the chemicals of concern and all chemicals of potential concern can be found in Tables 6-15 through 6-18 of the RI and in Table 3 of Appendix I to the FS.

Potential human health effects associated with exposure to the chemicals of potential concern were estimated quantitatively or qualitatively through the development of several hypothetical exposure pathways. These pathways were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses, and location of the Site. The Site is an active industrial area. Fencing and signs discourage access to the Site by non-workers. However, it is possible for trespassers to enter the Site. Land use in the area surrounding the Site is primarily residential. Future use of the Site is expected to remain industrial. However, because of nearby residential areas, future residential use of groundwater impacted by the Site was considered. The following is a brief summary of just the exposure pathways that were found to present a significant risk. A more thorough description of all exposure pathways evaluated in the risk assessment including estimates for an average exposure scenario, can be found in Section 6.0 of the RI and in Appendix I of the FS. For lead contaminated soil, a lead model was used to evaluate potential risks to workers of child-bearing age. For contaminated groundwater, ingestion of 2 l/day, 350 days/year for 30 yrs was presumed for an adult.

Excess lifetime cancer risks were determined for each exposure pathway by multiplying a daily intake level with the chemical specific cancer potency factor. Cancer potency factors have been developed by EPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk is unlikely to be greater than the risk predicted. The resulting risk estimates are expressed in scientific notation as a probability (e.g. 1 x $10^{-6}$ for 1/1,000,000) and indicate (using this example), that an average individual is not likely to have greater that a one in a million chance of developing cancer over 70 years as a result of site-related exposure (as defined) to the compound at the stated concentration. All risks estimated represent an "excess lifetime cancer risk" - or the additional cancer risk on top of that which we all face from other causes such as cigarette smoke or exposure to ultraviolet radiation from the sun. The chance of an individual developing cancer from all other (non-site related) causes has been estimated to be as high as one in three. EPA's generally acceptable risk range for site related exposure is $10^{-4}$ to $10^{-6}$. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances. A summary of the cancer toxicity data relevant to the chemicals of concern is presented in Table G-4.

In assessing the potential for adverse effects other than cancer, a hazard quotient (HQ) is calculated by dividing the daily intake level by the reference dose (RfD) or other suitable benchmark. Reference doses have been developed by EPA and they represent a level to which an individual may be exposed that is not expected to result in any deleterious effect. RfDs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. A HQ $\leq$ 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic noncarcinogenic effects from that chemical are unlikely. The Hazard Index (HI) is generated by adding the HQs for all chemical(s) of concern that affect the same target organ (e.g., liver) within or across those media to which the same individual may reasonably be exposed. A HI $\leq$ 1 indicates that toxic noncarcinogenic effects are unlikely. A summary of the noncarcinogenic toxicity data relevant to the chemicals of concern is presented in Table G-5.

Tables G-6 and G-7, respectively, depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in groundwater evaluated to reflect potential future residential groundwater ingestion corresponding to the reasonable maximum exposure (RME) scenario. Groundwater was evaluated by flow zone (i.e., shallow overburden, deep overburden, and bedrock) for on-site Areas of Concern (AOCs). Only those exposure pathways deemed relevant to the source control remedy being proposed are presented in this ROD. Readers are referred to Section 6.0 of the RI and Appendix I of the FS for a more comprehensive risk summary of all exposure pathways evaluated for all chemicals of potential concern and for estimates of the central tendency risk.

Compounds determined to be significant risk contributors for groundwater overall include benzene, 1,2-dichloroethane, 1,1-dichloroethene, 1,1,2,2-tetrachloroethane, tetrachloroethene, trichloroethene, bis(2-ethylhexyl)phthalate, aldrin, PCBs, arsenic, beryllium, manganese, and thallium. MCL exceedances were noted for the following compounds, listed by AOC:

- B&M Railroad Landfill: 1,2-dichloroethane, trichloroethene, and lead;
- RSI Landfill: benzene, trichloroethene, arsenic, lead, and thallium;
- B&M Locomotive Shop Disposal Areas: no exceedances noted;

- Old B&M Oil/Sludge Recycling Area: 1,2-dichloroethane, 1,1-dichloroethene, trichloroethene, bis(2-ethylhexyl)phthalate, arsenic, and lead; and
- Asbestos Lagoons: 1,2-dichloroethane, lead, and nickel.

The Adult Lead Model was used to evaluate the hazard potential posed by exposure of the developing fetus as the most sensitive receptor group. A geometric standard deviation (GSD) in blood lead concentration of 1.8 was used in the model. A GSD of 1.8 is typical of populations in which the factors that may affect blood lead concentrations are less heterogeneous than other populations in the United States. A typical blood lead concentration in the absence of site exposures was assumed to be 1.7 µg/dL, which is at the lower end of the plausible range observed in the National Health and Nutrition Examination Survey (NHANES III) conducted from 1988 to 1991. A representative intake rate of soil was assumed to be 50 mg/day based on occupational, indoor exposures to dust from outdoor soil. The absolute gastrointestinal absorption fraction for ingested lead in soil and soil-derived dust was assumed to be 0.12. The frequency of exposure was assumed to be 219 days per year. The outcome of the model revealed that greater than 5% of an exposed population was predicted to have blood lead levels greater than 10 µg/dl based on surface soil lead levels at the Contaminated Soil Area and the B&M Locomotive Shop Disposal Area, and on surface/subsurface soil lead levels combined at the Old B&M Oil-Sludge Recycling Area. It is EPA's goal to protect 95% of the sensitive population against blood lead levels in excess of 10 µg/dl blood. A lead concentration of 1,736 mg/kg in surface soil at the Contaminated Soil Area and the B&M Locomotive Shop Disposal Area, and in surface/subsurface soil lead levels combined at the Old B&M Oil-Sludge Recycling Area is considered protective of 95% of the sensitive population.

There are uncertainties that may affect the final estimates of human health risk at this Site. One assumption in the risk assessment was that the concentrations of chemicals would remain constant over time. This assumption may overestimate risks, depending on the degree of chemical degradation or transport to other media. Conversely, biodegradation of chemicals to more toxic chemicals was also not considered. RME risks are conservative since estimated risks are based on upper-bound exposure assumptions. Actual risks for some individuals within an exposed population may vary from those predicted depending upon their actual intake rates (e.g., drinking water ingestion rates) or body weights. Therefore, exposures and estimated risks are likely to be overestimated.

As discussed in Section E, above, trespassers and workers potentially may be chronically exposed to asbestos fibers released from the Asbestos Lagoons and the Asbestos Landfill.

Asbestos fibers in the Lagoons and the Asbestos Landfill, have the potential to become airborne, posing a human health threat via the inhalation pathway. Disposal of asbestos in the lagoons as well as subsequent partial removal has been documented. Furthermore, sampling of material in the lagoons confirms the presence of asbestos.

Under the National Emissions Standards for Hazardous Air Pollutants (NESHAP), in 1973 EPA defined asbestos containing material as material containing 1% asbestos or greater based detection limits available at the time. More recent data demonstrates that materials containing less than 1% asbestos may also pose a potential health risk in some circumstances.

## 2. Ecological Risk Assessment

The ERA evaluated the potential for contaminants in soil, surface water, and sediment to impact ecological receptor populations within seven distinct areas of concern (AOCs): Asbestos Lagoons, Old B&M Oil/Sludge Recycling Area, Contaminated Soils Area, B&M Railroad Landfill, B&M Locomotive Shop Disposal Areas, RSI Landfill, and site-wide surface water and sediment. The risk posed by exposure contaminants in surface water and sediment, will be further addressed in IHP OU4. Two AOCs, including the Asbestos Lagoons and the site-wide surface water and sediment data group, focused on exposures to aquatic and semi-aquatic species to surface water and sediments. Consequently, this ROD focuses on the ecological risk from exposure to soils, at five AOCs: Old B&M Oil/Sludge Recycling Area, Contaminated Soils Area, B&M Railroad Landfill, B&M Locomotive Shop Disposal Areas, and RSI Landfill.

Based on the ERA, it was determined that two of the AOCs, the Old B&M Oil/Sludge Recycling Area and Contaminated Soils Area, are unlikely to provide suitable habitat for terrestrial receptors, including soil invertebrates and terrestrial mammals, due primarily to the physical alteration of the habitats from industrial activities. As a result, additional evaluation of ecological risk within these two AOCs was not necessary since risk associated with potential exposure to site-related contaminants did not represent a complete exposure pathway for any receptor group. Therefore, evaluations associated with Old B&M Oil/Sludge Recycling Area and Contaminated Soils Area, are not included in the ERA and are not included in the ROD.

### Identification of Chemicals of Concern

Contaminants of concern (COCs) were identified using an effects-based screening involving the comparison of maximum contaminant concentrations to ecological benchmarks for soils within each of the three AOCs. Data used to identify COCs are summarized below in Table G-8 (B&M Railroad Landfill), Table G-9 (RSI Landfill), and Table G-10 (B&M Locomotive Shop Disposal Areas).

### Exposure Assessment

The upland habitats of the B&M Railroad Landfill, B&M Locomotive Shop Disposal Areas, and RSI Landfill provide habitat for a variety of terrestrial receptors, including soil invertebrates and small mammals. Terrestrial receptors may accumulate COCs through consumption of contaminated prey and incidental soil ingestion. Earthworms have significant exposure to soil contaminants both through direct dermal contact and through ingestion of large quantities of soil and detritus. Soil invertebrates such as earthworms serve as a prey base for other predators. Birds, as well as small terrestrial mammals like the northern short-tail shrew (*Blarina brevicauda*) may consume earthworms as a large portion of their diets. Small mammals such as shrews may serve as a significant food base for carnivorous wildlife. Exposure pathways, assessment endpoints, and measurement endpoints are summarized below in Table ECO-1.

Risk to soil invertebrates was evaluated by comparing soil concentrations to soil ecological benchmarks. Exposure point concentrations consisted of the mean and maximum soil concentration (0-1 ft depth interval) for each COC. Earthworm toxicity reference values (TRVs) consisted of toxicological benchmarks developed for earthworms, as well as ecological screening values for soils, and maximum allowable contaminant levels derived for the protection of the environment.

Short-tailed shrew, representing small terrestrial mammals, were selected as the assessment population to evaluate risks associated with exposure to COCs in each AOC. Potential risk from soil COCs to assessment populations was estimated using dietary exposure models. Because site-specific tissue data were not available, dietary doses were modeled from soil concentrations. To assist in exposure estimation for small terrestrial mammals, COC concentrations in prey (earthworms) were modeled directly from COC concentrations in soil. Exposure point concentrations consisted of the mean and maximum soil concentration (0-1 ft depth interval) for each COC, and modeled earthworm tissue concentrations based on these values.

**Table ECO-1**
**Ecological Exposure Pathways of Concern – Surface Soil**

| Exposure Medium | Sensitive Environment Flag Y or N | Receptor | Endangered/ Threatened Species Flag Y or N | Exposure Routes | Assessment Endpoints | Measurement Endpoints |
|---|---|---|---|---|---|---|
| Soil | N | Soil Invertebrates | N | Ingestion and direct contact with chemicals in soil. | Sustainability (survival, growth, reproduction) of local populations of soil invertebrates | Compare chemical concentrations in soil to toxicity benchmarks which are indicative of potential impairment |
| Soil | N | Small terrestrial mammals | N | Ingestion and direct contact with chemicals in soil. | Sustainability (survival, growth, reproduction) of local populations of small terrestrial mammals | Compare modeled exposures to published values which are indicative of potential impairment. |

**Ecological Effects Assessment**

Risk to soil invertebrates was evaluated by comparing COC concentrations in soil to soil ecological benchmarks. Whether COCs exceeded lower risk thresholds or upper risk thresholds for soil invertebrates was based on the magnitude of the exceedences of benchmark values.

Modeled dietary doses for shrew were compared to toxicity reference values (TRVs) obtained from the literature. TRVs were predominantly selected from studies which reported no-observed-adverse-effects-levels (NOAELs). When a suitable NOAEL was unavailable, studies which reported lowest-observed-adverse-effects-levels (LOAELs) were used and adjusted downward with an uncertainty factor of 10. Hazard quotients (HQs) were then calculated for each COC using the modeled doses and NOAEL TRVs.

Based on further data evaluation following the remedial investigation, the models/endpoints were revised. Background information on the updated calculations is presented in the FS.

**Risk Characterization**

The RI ecological risk assessment indicated soil COCs potentially posed a risk to populations of both earthworms (representative of soil invertebrates) and shrews (representative of the small mammal community) at B&M Railroad Landfill and the B&M Locomotive Shop Disposal Areas. Risks to terrestrial receptors from exposure to soils at RSI Landfill were minimal.

Although potential risks were identified in the ERA for soil invertebrates, the confidence in the conclusions were low, as these were based on conservative screening benchmarks. Development of the preliminary remediation goals (PRGs) was based on shrew endpoints to emphasize the importance of contamination in the food chain and risk to the small mammal community. Risks were identified for exposures of shrew to high concentrations of cadmium in soil at the B&M Railroad Landfill and to copper and lead in soils at the B&M Locomotive Shop Disposal Areas.

PRGs were developed to identify a soil concentration at which ecological effects are likely to occur. The PRGs are based on a daily dose resulting in a hazard quotient (HQ) of 1.0, and using a protective NOAEL TRV. Since food COC concentrations were estimated from soil concentrations, the food chain models were used to back-calculate a soil concentration that corresponds to a daily dose resulting in an HQ of 1.0. This approach assumes that concentrations are evenly distributed throughout the site or foraging area. PRGs are summarized below (Table ECO-2) for those COCs identified as posing risk to small terrestrial mammals.

**Table ECO-2**
**COC Concentrations Expected to Provide Adequate Protection of Ecological Receptors**

| Habitat Type/ Name | Exposure Medium | COC | Protective Level | Units | Basis[1] | Assessment Endpoint |
|---|---|---|---|---|---|---|
| B&M Railroad Landfill | Soil | Cadmium | 15.4 | mg/kg | Food chain models, NOAEL | Sustainability (survival, growth, reproduction) of local populations of small terrestrial mammals |
| B&M Locomotive Shop Disposal Area | Soil | Copper | 2,213 | mg/kg | Food chain models, NOAEL | Sustainability (survival, growth, reproduction) of local populations of small terrestrial mammals |
| | Soil | Lead | 868 | mg/kg | Food chain models, NOAEL | Sustainability (survival, growth, reproduction) of local populations of small terrestrial mammals |

[1] Exposure factores and toxicity reference values for the development of Preliminary Remediation Goals for soils are provided in Appendix B.2 of the Feasibility Study for Iron Horse Park Superfund Site, 3rd Operable Unit (M&E, 2004)

## 3. *Basis for Response Action*

Because the baseline human health and ecological risk assessments revealed that adult workers and small mammals potentially exposed to compounds of concern in soil via ingestion and contact may present an unacceptable human health risk as evaluated by the Adult Lead Model or unacceptable ecological risk (exceedance of NOEL TRVs), actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment. Workers and trespassers may also potentially be exposed to released asbestos fibers via inhalation. A response action will be selected and implemented to address risks associated with soil.

## H. REMEDIATION OBJECTIVES

As stated previously, the reasonable, expected, future use for the site is industrial. The risk assessment evaluated exposure pathways associated with site workers as well as potential trespassers. Based on preliminary information relating to types of contaminants, environmental media of concern, and potential exposure pathways, remedial action objectives (RAOs) were developed to aid in the development and screening of alternatives. These RAOs were developed to mitigate, restore and/or prevent existing and future potential threats to human health and the environment. The RAOs for the selected remedy for OU3 are:

<u>Human Health</u>

- Soil - Prevent ingestion of lead from soil-derived dust at the B&M Locomotive Shop Disposal Areas, Old B&M Oil/Sludge Recycling Area, and Contaminated Soils Area that results in estimated maternal blood levels of greater than 4.2 $\mu$g/dL, a site-specific level protective of a 95th percentile fetal blood lead level of 10 $\mu$g/dL. This results in preventing exposure to lead soil concentrations greater than 1,736 mg/kg

- Soil - Prevent exposure to asbestos at the Asbestos Landfill.

- Soil - Prevent exposure to asbestos at the Asbestos Lagoons.

- Groundwater - Limit migration of contaminants in the B&M Landfill, RSI Landfill, B&M Locomotive Shop Disposal Areas, Old B&M Oil/Sludge Recycling Area, Contaminated Soils Area and Asbestos Lagoons into groundwater.

<u>Ecological</u>

- Protect short-tailed shrews and other smalls mammals from exposure to levels of metals associated with a HQ greater than 1 (cadmium) in soils at the B&M Railroad Landfill.
- Protect short-tailed shrews and other smalls mammals from exposure to levels of metals associated with a HQ greater than 1 (copper and lead) in soils at the B&M Locomotive Shop Disposal Areas.

(Other RAOs were developed and presented in the FS. However, those related to surface water and sediment, and management of migration of groundwater (i.e. potential ingestion) will be addressed as part of OU4.)

## I. DEVELOPMENT AND SCREENING OF ALTERNATIVES

### A. Statutory Requirements/Response Objectives

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences, including: a requirement that EPA's remedial action, when complete, must comply with all federal and more stringent state environmental and facility siting standards, requirements, criteria or limitations, unless a waiver is invoked; a requirement that EPA select a remedial action that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and a preference for remedies in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances is a principal element over remedies not involving such treatment. Response alternatives were developed to be consistent with these Congressional mandates.

B. Technology and Alternative Development and Screening

CERCLA and the National Contingency Plan (NCP), 40 CFR Part 300, set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives were developed for the site.

With respect to source control, the RI/FS developed a range of alternatives in which treatment that reduces the toxicity, mobility, or volume of the hazardous substances is a principal element. This range included an alternative that removes or destroys hazardous substances to the maximum extent feasible, eliminating or minimizing to the degree possible the need for long term management. This range also included alternatives that treat the principal threats posed by the site but vary in the degree of treatment employed and the quantities and characteristics of the treatment residuals and untreated waste that must be managed; alternative(s) that involve little or no treatment but provide protection through engineering or institutional controls; and a no action alternative at each Area of Concern.

As discussed in Section 2 of the FS, soil and groundwater treatment technology options were identified, assessed and screened based on implementability, effectiveness, and cost. These technologies were combined into source control (SC) and management of migration (MM) alternatives for each Area of Concern. Section 4 of the FS presented the remedial alternatives developed by combining the technologies identified in the previous screening process in the categories identified in Section 300.430(e)(3) of the NCP, as well as by combining the technologies for each Area of Concern in to Site Wide remedial alternatives. The purpose of the initial screening was to narrow the number of potential remedial actions for further detailed analysis while preserving a range of options. By this process, EPA initially developed 72 Site Wide remedial alternatives which contained source control and management of migration measures. Of these 72 alternatives EPA retained 15 alternatives for detailed analysis. Each alternative was then evaluated in detail in Section(s) 5 of the FS.

As discussed above in Section D. of this ROD, during the alternatives analysis development process of the FS, groundwater modeling demonstrated that groundwater cleanup alternatives being considered would not be effective in achieving RAOs in a reasonable time period. Because of this, the selection of a remedy for groundwater was deferred to OU4. A new section, Section 7, was developed to conduct the comparative analysis process for source control alternatives by Area of Concern. As discussed earlier, each Area of Concern tends to be distinct with regard to source control issues (i.e. contamination and risk). Section 7 evaluates the source control alternatives for each Area of Concern separately.

## J. DESCRIPTION OF ALTERNATIVES

This Section provides a narrative summary of each source control and management of migration alternative evaluated.

Source Control Alternatives Analyzed

The source control alternatives analyzed for the Site discussed by Area of Concern are summarized below. A more complete, detailed presentation of each alternative is found in Section 7 of the FS.

### B&M RAILROAD LANDFILL

Table 7-1 presents a summary of the primary evaluation factors and a comparative assessment of the technologies/process options evaluated for AOC #1, B&M Railroad Landfill which encompasses 12.4 acres. Table L-8 presents a summary of the ARARs associated with this AOC. The media of concern was soil and source control of contaminants in the landfill to protect groundwater. These technologies/process options for remediation of soil include:

- **No Action**
  - Reevaluate taking no action at a minimum once every 5 years as part of the 5-year review process for the entire Site

- **Institutional Action -**
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring of soil and groundwater;

- **InSitu-1 - Monitored Natural Attenuation**
  - In-situ remedy of monitored natural attenuation
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - monitoring of soil and groundwater;

- **Source Control-1 - Capping**
  - Excavation of landfill material from the edge of the wetland, to minimize impacts on the wetland
  - Construction of double-barrier (EPA Region 1, Alternative CERCLA) landfill cap
  - Maintenance of cap
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Restoring wetlands impacted by the cleanup
  - Monitoring of groundwater to assess the protectiveness of the cap;

## RSI LANDFILL

Table 7-3 presents a summary of the primary evaluation factors and a comparative assessment of the technologies/process options evaluated for AOC #2, RSI Landfill which encompasses 2.5 acres. Table L-9 presents a summary of the ARARs associated with this AOC. Human health and ecological risk limits were not exceeded at this AOC for soil, but contaminants in the soil have the potential to migrate into groundwater. Therefore, single-barrier capping (SC-1) as part of source control for groundwater has been established as a technology/process option for remediation in this area.

- **No Action**
  - Reevaluate taking no action at a minimum once every 5 years as part of the 5-year review process for the entire Site

- **Source Control-1 - Capping**
  - Construction of single-barrier (Subtitle D - Solid Waste) landfill cap
  - Maintenance of cap
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring of groundwater to assess the protectiveness of the cap;

## B&M LOCOMOTIVE SHOP DISPOSAL AREAS

Table 7-5 presents a summary of the primary evaluation factors and a comparative assessment of the technologies/process options evaluated for AOC #3, B&M Locomotive Shop Disposal Areas which together encompass 4.7 acres. Table L-10 presents a summary of the ARARs associated with this AOC. The media of concern was soil and source control of contaminants in the disposal area to protect groundwater. These technologies/process options for remediation of soil include:

- **No Action**
  - Reevaluate taking no action at a minimum once every 5 years as part of the 5-year review process for the entire Site

- **Institutional Action** -
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring;

- **InSitu-1 - Monitored Natural Attenuation**
  - In-situ remedy of monitored natural attenuation
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring of groundwater

- **Source Control-1 - Capping**
  - Construction of single-barrier (Subtitle D - Solid Waste) landfill cap
  - Maintenance of cap
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring of groundwater to assess the protectiveness of the cap

- **Source Control-2 On-Site Disposal**
  - Excavation of soil/waste and placement under caps at other on-site AOCs;

- **OnSite-1 - Solidification/Stabilization**
  - Excavation of soil/waste to local staging area
  - Remove debris and large(>3/4 inch) stones for disposal under landfill cap at B&M or RSI Landfill
  - Mix excavated material with stabilizing additives
  - Place stabilized material as backfill (depending on what additives are used, pending pre-design treatability studies, it is possible that mixing/treatment with asphalt emulsion may be feasible. In that event, treated material may be suitable for a paving sub-grade layer
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring of groundwater to assess the protectiveness of the treatment

- **OnSite-2 - Soil Washing/Chemical Extraction**
  - Excavation of soil/waste to local staging area
  - Remove debris and large(>3/4 inch) stones for disposal under landfill cap at B&M or RSI Landfill
  - Soils are rinsed of fine material(<2mm) and returned for placement as backfill
  - Fines are mixed with additives (pending pre-design treatability studies) to remove site contaminants
  - Clean fines are returned as backfill
  - Sludge is dewatered prior to disposal
  - Treated water is discharged to groundwater via injection wells
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring of groundwater to assess the protectiveness of the treatment

**OLD B&M OIL/SLUDGE RECYCLING AREA**

Table 7-7 presents a summary of the primary evaluation factors and a comparative assessment of the technologies/process options evaluated for AOC #4, Old B&M Oil/Sludge Recycling Area which encompasses 7 acres. Table L-11 presents a summary of the ARARs associated with this AOC. The media of concern was soil and source control of contaminants in the soil to prevent migration into groundwater. These technologies/process options for remediation of soil include:

- **No Action**

- Reevaluate taking no action at a minimum once every 5 years as part of the 5-year review process for the entire Site

- **Inst. Action -**
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring;

- **InSitu-1 - Monitored Natural Attenuation**
  - In-situ remedy of monitored natural attenuation
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring of groundwater

- **Source Control-1- Capping**
  - Construction of single-barrier asphalt cap (Subtitle D - Solid Waste standards to prevent direct contact with contaminated soil and prevent migration of contaminants to groundwater)
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring of groundwater to assess the protectiveness of the cap

- **Source Control-2 - On-Site Disposal**
  - Excavation of soil/waste and placement under caps at other on-site AOCs;
  - Backfilling of excavated area

- **OnSite-1 - Solidification/Stabilization**
  - Excavation of soil/waste to local staging area
  - Remove debris and large(>3/4 inch) stones for disposal under landfill cap at B&M or RSI Landfill
  - Mix excavated material with stabilizing additives
  - Place stabilized material as backfill (depending on what additives are used, pending pre-design treatability studies, it is possible that mixing/treatment with asphalt emulsion may be feasible. In that event, treated material may be suitable for a paving sub-grade layer
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring of groundwater to assess the protectiveness of the treatment

- **OnSite-2 - Soil Washing/Chemical Extraction**
  - Excavation of soil/waste to local staging area
  - Remove debris and large(>3/4 inch) stones for disposal under landfill cap at B&M or RSI Landfill
  - Soils are rinsed of fine material(<2mm) and returned for placement as backfill
  - Fines are mixed with additives(pending pre-design treatability studies) to remove site

contaminants
- Clean fines are returned as backfill
- Sludge is dewatered prior to disposal
- Treated water is discharged to groundwater via injection wells
- Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
- Monitoring of groundwater to assess the protectiveness of the treatment

## CONTAMINATED SOILS AREA

Table 7-9 presents a summary of the primary evaluation factors and a comparative assessment of the technologies/process options evaluated for AOC #5, Contaminated Soils Area which encompasses approximately 6.7 acres. Table L-12 presents a summary of the ARARs associated with this AOC. The media of concern was soil and source control of contaminants to prevent migration into groundwater. These technologies/process options for remediation of soil include:

- **No Action**
  - Reevaluate taking no action at a minimum once every 5 years as part of the 5-year review process for the entire Site

- **Inst. Action -**
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring;

- **InSitu-1 - Monitored Natural Attenuation**
  - In-situ remedy of monitored natural attenuation
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring of groundwater

- **InSitu-2 - In-Situ Solidification/Stabilization**
  - application of solidification/stabilization agents (agent requirements to be determined through pre-design analysis)
  - rototill/mixing of agents with contaminated soil
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring of groundwater to assess the protectiveness of the treatment

- **InSitu-3 - In-Situ Soil Flushing**
  - Application of flushing solvents (following pre-design studies) to leach contaminants into groundwater
  - Collection of contaminated groundwater for treatment via extraction wells
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)

- Monitoring of groundwater to assess the protectiveness of the treatment

- **Source Control-1- Capping**
  - Construction of single-barrier asphalt cap (Subtitle D - Solid Waste standards to prevent direct contact with contaminated soil and to prevent migration of contaminants to groundwater
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring of groundwater to assess the protectiveness of the cap

- **Off Site - Soil Excavation and Off Site Treatment/Disposal**
  - Removal and disposal of existing asphalt
  - Excavation of contaminated soil
  - Transport contaminated soil to treatment facility for treatment by asphalt batching (pending pre-design treatability studies)
  - Backfill excavated area with clean soil

- **OnSite-1 - Solidification/Stabilization**
  - Excavation of soil/waste to local staging area
  - Remove debris and large(>3/4 inch) stones for disposal under landfill cap at B&M or RSI Landfill
  - Mix excavated material with stabilizing additives(pending pre-design treatability studies)
  - Place stabilized material as backfill (depending on what additives are used, it is possible that mixing/treatment with asphalt emulsion may be feasible. In that event, treated material may be suitable for a paving sub-grade layer
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring of groundwater to assess the protectiveness of the treatment

- **OnSite-2 - Soil Washing/Chemical Extraction**
  - Excavation of soil/waste to local staging area
  - Remove debris and large(>3/4 inch) stones for disposal under landfill cap at B&M or RSI Landfill
  - Soils are rinsed of fine material(<2mm) and returned for placement as backfill
  - Fines are mixed with additives to remove site contaminants(pending pre-design treatability studies)
  - Clean fines are returned as backfill
  - Sludge is dewatered prior to disposal
  - Treated water is discharged to groundwater via injection wells
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring of groundwater to assess the protectiveness of the treatment

## ASBESTOS LANDFILL

Table 7-11 presents a summary of the primary evaluation factors and a comparative assessment of the technologies/process options evaluated for AOC #6, Asbestos Landfill which encompasses 13.3 acres. Table L-13 presents a summary of the ARARs associated with this AOC. The only media of concern was soil. Previous sections of this report provided the option of capping this AOC under the assumption that the existing cap may not be adequately protective. However, recent Site visits have determined that the existing cap is protective if maintained properly. Therefore, the technologies/process options for remediation of soil include:

- **No Action**
  - Reevaluate taking no action at a minimum once every 5 years as part of the 5-year review process for the entire Site

- **Inst. Action -**
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Construction of perimeter fence
  - Maintenance of cap
  - Monitoring to assess the protectiveness of the cap;

## ASBESTOS LAGOONS

Table 7-13 presents a summary of the primary evaluation factors and a comparative assessment of the technologies/process options evaluated for AOC #7, Asbestos Lagoons which encompass 1.9 acres. Table L-14 presents a summary of the ARARs associated with this AOC. The media of concern was soil and source control of contaminants in the lagoon sediment to protect groundwater. These technologies/process options for remediation of soil include:

- **No Action**
  - Reevaluate taking no action at a minimum once every 5 years as part of the 5-year review process for the entire Site

- **Inst. Action -**
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Monitoring;

- **Source Control-1- Capping**
  - Construction of single-barrier (Subtitle D - Solid Waste) landfill cap
  - Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures)
  - Maintenance of cap
  - Monitoring of groundwater to assess the protectiveness of the cap

- **Source Control-2 - On-Site Disposal**
  - Excavation of soil/waste and placement under caps at other on-site AOC
  - Backfilling of excavated area

## K. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that at a minimum EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives.

A detailed analysis was performed on the alternatives using the nine evaluation criteria in order to select a site remedy. The following is a summary of the comparison of each alternative's strengths and weaknesses with respect to the nine evaluation criteria. These criteria are summarized as follows:

### Threshold Criteria

The two threshold criteria described below must be met in order for the alternatives to be eligible for selection in accordance with the NCP:

1. **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

2. **Compliance with applicable or relevant and appropriate requirements (ARARs)** addresses whether or not a remedy will meet all Federal environmental and more stringent State environmental and facility siting standards, requirements, criteria or limitations, unless a waiver is invoked.

### Primary Balancing Criteria

The following five criteria are utilized to compare and evaluate the elements of one alternative to another that meet the threshold criteria:

3. **Long-term effectiveness and permanence** addresses the criteria that are utilized to assess alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that they will prove successful.

4. **Reduction of toxicity, mobility, or volume through treatment** addresses the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site.

5. **Short term effectiveness** addresses the period of time needed to achieve protection and

any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.

6. **Implementability** addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. **Cost** includes estimated capital and Operation Maintenance (O&M) costs, as well as present-worth costs.

**Modifying Criteria**

The modifying criteria are used as the final evaluation of remedial alternatives, generally after EPA has received public comment on the RI/FS and Proposed Plan:

8. **State acceptance** addresses the State's position and key concerns related to the preferred alternative and other alternatives, and the State's comments on ARARs or the proposed use of waivers.

9. **Community acceptance** addresses the public's general response to the alternatives described in the Proposed Plan and RI/FS report.

## COMPARISON OF SOURCE CONTROL CLEANUP OPTIONS BY AREA OF CONCERN (AOC)

Following the detailed analysis of each individual alternative, a comparative analysis, focusing on the relative performance of each alternative against the nine criteria, was conducted. This comparative analysis can be found in Tables 7-1 through 7-13 of the FS, which are also attached to this ROD.

The section below presents the nine criteria and a brief narrative summary of the alternatives and the strengths and weaknesses according to the detailed and comparative analysis. Only those alternatives which satisfied the first two threshold criteria were balanced and modified using the remaining seven criteria.

Discussed briefly below are the relative strengths and weaknesses of the cleanup alternatives considered for the different areas of concern. In addition, a graphic comparison is presented in the tables that follow the discussion. The cleanup alternatives are compared against the list of nine evaluation criteria that were described earlier. Of these, the criteria for *State Acceptance* and *Community Acceptance* are evaluated after the public comment period. For these criteria, see the state concurrence letter (Appendix A) and the Responsiveness Summary (Part 3).

**I. B&M Railroad Landfill.** The media of concern soil and source control of contaminants in the landfill to protect groundwater. There is a risk from soil contamination to ecological receptors (from metals). Table 7-1 presents a summary of the primary evaluation factors and a comparative assessment of the technologies/process options evaluated for AOC #1, B&M Railroad Landfill which encompasses 12.4 acres. The technologies/process options to control these risks include:

- **No Action** Subject to a review at least every five years as required by CERCLA since wastes would be left in place;
- **Inst. Action:** Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures) as well as monitoring;
- **InSitu-1**: In-situ remedy of monitored natural attenuation and institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures) as well as monitoring;
- **SC-1:** Source control remedy consisting of horizontal containment (*i.e.*, cap), institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures) as well as monitoring.

<u>Analysis of Nine Criteria</u>

*Overall Protection of Human Health and the Environment:*

The **Source Control (SC-1)** alternative is the only alternative which provides overall protection, through capping. Capping prevents exposure to the environment from unacceptable contaminant levels in soils. Migration of contaminants into groundwater is also prevented. Institutional actions and monitoring will ensure that the cap is maintained and remains protective. The other alternatives do not reduce or eliminate the potential for exposure to unacceptable contaminant levels in soils for ecological receptors. The other alternatives also don't prevent the migration of contaminants into groundwater.

*Compliance with ARARs:*

This AOC is adjacent to a wetland/surface water body. As such there are numerous federal and state stream, wetland and floodplain regulations, which any chosen alternative must meet. In addition, this AOC is an uncapped landfill. Because of this, there are numerous regulations related to landfill closure and post-closure requirements. Only the **Source Control (SC-1)** alternative meets the requirements of the closure and post-closure regulations, in particular landfill capping requirements. The other alternatives do not provide for any activities that could constitute closure or post-closure under the regulations.

*Long-Term Effectiveness and Permanence:*

Only the **Source Control (SC-1)** alternative will provide continued long-term protection. Installation, maintenance, and monitoring of a cap will virtually eliminate exposure and risk to ecological receptors and will prevent migration of contaminants into groundwater. The other alternatives do not require actions that prevent ecological receptors from coming onto contact with contaminated media, and therefore do not provide long-term protection. The other alternatives also will not prevent contaminants from migrating into groundwater.

*Reduction of Toxicity, Mobility and Volume through Treatment:*

None of the alternatives involve treatment. Although the FS reviewed treatment alternatives no treatment alternative was found suitable for this area.

*Short-Term Effectiveness:*

While this criterion encompasses a number of issues, the most significant issue is ***time until Remedial Action Objectives are achieved.*** For the Source Control (SC-1) alternative, this time period is 2 years. For the other alternatives, the time period is estimated at greater than 30 years.

*Implementability:*

Implementability is primarily related to three factors: technical feasibility (*i.e.,* can it be constructed, is it reliable); administrative feasibility; and the availability of services and materials to implement the remedy. First, all of the alternatives are implementable from a construction standpoint. The **Source Control** (SC-1) alternative is the most reliable in meeting Remedial Action Objectives, while the **No Action** and **Institutional Action** alternatives are the least reliable. Second, to varying degrees, all of the alternatives are administratively feasible, with all but the **No Action** alternative containing provisions for institutional controls such as deed restrictions. Therefore, these alternatives will require a higher degree of administrative effort than the **No Action** alternative. Third, services and materials are available for all alternatives.

*Cost:*

| | |
|---|---|
| No-Action | \$0 (there will be a slight incremental cost associated with site wide Five-Year Review) |
| Institutional Action | \$0.90 million |
| In-Situ | \$0.97 million |
| Source Control | \$9.66 million |

**II. RSI Landfill.** The only media of concern is source control of contaminants in the landfill to protect groundwater. Risk limits for human health or ecological receptors from contact with soil were not exceeded at this AOC. Two technology/process options were considered: capping (SC-1); and No Action. Table 7-3 presents a summary of the primary evaluation factors and a comparative assessment of the technologies/process options evaluated for AOC #2, RSI Landfill which encompasses 2.5 acres. Capping was considered as part of source control for groundwater cleanup. The technologies/process options to control these risks include:

- **No Action** Subject to a review at least every five years as required by CERCLA since wastes would be left in place;

- **SC-1:** Source control remedy consisting of horizontal containment (*i.e.*, cap), institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures) as well as monitoring.

*Compliance with ARARs:*

This AOC is an uncapped landfill. Therefore, there are numerous regulations related to landfill closure and post-closure requirements, particularly regarding landfill capping. Although OU3 does not address groundwater directly, the source control remedies to be implemented as part of the OU3 ROD will have a positive impact on groundwater quality. Capping the landfill will help prevent further migration of contaminants (arsenic and manganese) from soil to groundwater, where a potential risk has been demonstrated. The **Source Control (SC-1)** alternative meets the requirements of the closure and post-closure regulations. The **No Action** alternative does not satisfy this criteria since it does not provide for any activities that could constitute closure or post-closure under the regulations.

*Long-Term Effectiveness and Permanence:*

Only the **Source Control (SC-1)** alternative will provide continued long-term protection. Installation, maintenance, and monitoring of a cap will virtually eliminate migration of contaminants from the landfill into groundwater. The **No Action** alternative does not require actions that prevent migration of contaminants from contaminated media, and therefore do not provide long-term protection.

*Reduction of Toxicity, Mobility and Volume through Treatment:*

None of the alternatives involve treatment. Although the FS reviewed treatment alternatives no treatment alternative was found suitable for this area.

*Short-Term Effectiveness:*

While this criterion encompasses a number of issues, the most significant issue is ***time until Remedial Action Objectives are achieved.*** For the Source Control (SC-1) alternative, this time period is 2 years for construction and implementation of institutional controls. For the **No Action** alternative, the time period is estimated at greater than 30 years.

*Implementability:*

Implementability is primarily related to three factors: technical feasibility (*i.e.*, can it be constructed, is it reliable); administrative feasibility; and the availability of services and materials to implement the remedy. First, both alternatives are implementable from a construction standpoint. The **Source Control** (SC-1) alternative is the most reliable in meeting Remedial Action Objectives, while the **No Action** alternative is the least reliable. Second, to varying degrees, both alternatives are administratively feasible, but the **No Action** alternative does not contain provisions for institutional controls such as deed restrictions. Therefore, the **Source**

**Control** alternative will require a higher degree of administrative effort than the **No Action** alternative. Third, services and materials are available for both alternatives.

*Cost:*

| | |
|---|---|
| No-Action | $0 (there will be a slight incremental cost associated with site wide Five-Year Review) |
| Source Control | $2.49 million |

**III. B&M Locomotive Shop Disposal Areas.** The media of concern are soil and source control of contaminants in the disposal area to protect groundwater. There is potential risk in soil to both human health (from lead) and ecological (from metals) receptors. Table 7-5 presents a summary of the primary evaluation factors and a comparative assessment of the technologies/process options evaluated for AOC #3, B&M Locomotive Shop Disposal Areas which together encompass 4.7 acres. The technologies/process options to control these risks include:

- **No Action** Subject to a review at least every five years as required by CERCLA since wastes would be left in place;
- **Inst. Action:** Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures) as well as monitoring;
- **InSitu-1:** In-situ remedy of monitored natural attenuation and institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures) as well as monitoring;
- **SC-1:** Source control remedy consisting of horizontal containment (*i.e.* cap), institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures) as well as monitoring;
- **SC-2:** Source control remedy consisting of soil/waste excavation and placement under caps at other on-site AOCs;
- **OnSite-1:** Remedy consisting of soil/waste excavation and on-site treatment via solidification/stabilization;
- **OnSite-2:** Remedy consisting of soil/waste excavation and on-site treatment via soil washing/chemical extraction.

Analysis of Nine Criteria

*Overall Protection of Human Health and the Environment:*

The **No Action** alternative will not be protective of human health or the environment as it does not significantly reduce or eliminate potential exposures to human or ecological receptors, nor will migration of contaminants into groundwater be addressed. The **Institutional Action** and **InSitu-1** alternatives will be somewhat more protective of human health, but not the environment, in that access (and exposure) to contaminated material will be controlled. Furthermore, migration of contaminants into groundwater will not be addressed. The **SC-1, SC-**

**2, OnSite-1** and **OnSite-2** alternatives will provide overall protection of human health and the environment by effectively reducing or eliminating potential exposure to contaminated soil and dust and eliminating migration of contaminants from soil to groundwater.

*Compliance with ARARs:*

Of the seven alternatives considered, four (**SC-1, SC-2, OnSite-1** and **OnSite-2**) will have activities that impact wetland areas. These impacts would need to be limited or mitigated in order to meet ARARs. The nature of this AOC requires that landfill closure and post-closure requirements be met. These four alternatives would meet the landfill closure and post-closure requirements. The **No Action, Institutional Action** and **InSitu-1** alternatives would not meet the landfill closure and post-closure requirements.

*Long-Term Effectiveness and Permanence:*

Under the **No Action** alternative residual risks from soil contaminants will remain. Therefore, it would not provide overall protection from exposures to both human and ecological receptors nor prevent migration of contaminants into groundwater and therefore will not provide long-term effectiveness. Under the **Institutional Action** and **InSitu-1** alternatives, while access to contaminated material will be controlled, over time migration of contaminants may occur. The **Institutional Action** and **InSitu-1**, while exhibiting greater effectiveness than the **No Action** alternative, still only achieve a moderate level of effectiveness.

The **SC-1, SC-2, OnSite-1** and **OnSite-2** alternatives will provide long-term effectiveness in protecting from exposures to both human health and ecological receptors and preventing migration of contaminants into groundwater. The **SC-1** and **SC-2** caps must be constructed, maintained, and monitored to ensure continued protection; the **OnSite-1** and **OnSite-2** treatment alternatives are effectively permanent.

*Reduction of Toxicity, Mobility and Volume through Treatment:*

The **No Action, Institutional Action, InSitu-1, SC-1** and **SC-2** alternatives do not utilize treatment and therefore provide no reduction of toxicity, mobility and volume through treatment. The **OnSite-1** and **OnSite-2** alternatives do utilize treatment and would result in permanent reduction of toxicity, mobility and volume through treatment.

*Short-Term Effectiveness:*

The **No Action** alternative takes no actions and therefore does not cause any increase in short-term risk. With standard control measures (dust control, air monitoring), none of the alternatives will cause increases of short-term risk to the community or workers. The environmental impacts to natural habitats from the implementation of these alternatives, range from: no impact (**No Action**); temporary and relatively minor impacts (**Institutional Action** and **InSitu-1**); and greater impacts (**SC-1, SC-2, OnSite-1** and **OnSite-2**). The potential impacts to adjacent wetlands from disturbance during implementation of these alternatives is expected to be moderate and would be mitigated.

The time until Remedial Action Objectives are achieved varies considerably. The **No Action, Institutional Action** and **InSitu-1** alternatives are expected to take greater than 30 years. The **SC-1, SC-2, OnSite-1** and **OnSite-2** alternatives are expected to take 2 to 3 years.

*Implementability:*

Implementability is primarily related to three factors: technical feasibility (*i.e.*, can it be constructed, is it reliable); administrative feasibility; and the availability of services and materials to implement the remedy. First, all of the alternatives are feasible to implement. The **No Action, Institutional Action** and **InSitu-1** alternatives would each take little effort to construct; the **SC-1, SC-2, OnSite-1** and **OnSite-2** alternatives would require a greater effort to construct. The **No Action** and **Institutional Action** alternatives are not considered reliable in achieving Remedial Action Objectives. The **InSitu-1** alternative is considered slightly reliable in achieving Remedial Action Objectives. The **SC-1, SC-2, OnSite-1** and **OnSite-2** alternatives are considered reliable in achieving Remedial Action Objectives. Second, all of the alternatives are considered administratively feasible. Third, services and materials are available for implementation of all alternatives. Services for the **OnSite-1** and **OnSite-2** alternatives are somewhat less commonly available when compared with the other alternatives.

*Cost:*

| | |
|---|---|
| No-Action | $0 (there will be a slight incremental cost associated with site wide Five-Year Review) |
| Institutional Action | $ 0.77 million |
| InSitu | $ 0.83 million |
| Source Control-1 | $ 2.61 million |
| Source Control-2 | $ 8.68 million |
| OnSite-1 | $34.16 million |
| OnSite-2 | $42.59 million |

**IV. Old B&M Oil/Sludge Recycling Area.** The media of concern being addressed is soil with potential human health risk (from lead) and source control of contaminants in the soil to prevent migration into groundwater. Table 7-7 presents a summary of the primary evaluation factors and a comparative assessment of the technologies/process options evaluated for AOC #4, Old B&M Oil/Sludge Recycling Area which encompasses 7 acres. The technologies/process options for soil cleanup include:

- **No Action** Subject to a review at least every five years as required by CERCLA since wastes would be left in place;
- **Inst. Action:** Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures) as well as monitoring;
- **InSitu-1:** In-situ remedy of monitored natural attenuation and institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and

security measures) as well as monitoring;

- **SC-1**: Source control remedy consisting of horizontal containment (*i.e.* cap), institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures) as well as monitoring;
- **SC-2**: Source control remedy consisting of soil excavation and placement under caps at other on-site AOCs;
- **OnSite-1**: Remedy consisting of soil excavation and on-site treatment via solidification/stabilization;
- **OnSite-2**: Remedy consisting of soil excavation and on-site treatment via soil washing/chemical extraction.

Analysis of Nine Criteria

*Overall Protection of Human Health and the Environment:*

The **No Action** alternative will not be protective of human health or the environment as it does not significantly reduce or eliminate potential exposures to human receptors, nor does it prevent contaminant migration to groundwater. The **Institutional Action** and **InSitu-1** alternatives will be somewhat more protective in that human access (and exposure) to contaminated material will be controlled, but migration of contaminants into groundwater would not be addressed. The **SC-1**, **SC-2**, **OnSite-1** and **OnSite-2** alternatives will provide overall protection of human health by effectively reducing or eliminating potential exposure to soil and dust and preventing the migration of contaminants into groundwater. There are no ecological risks due to soil at this area.

*Compliance with ARARs:*

The **SC-1, SC-2, OnSite-1** and **OnSite-2** alternatives will meet the closure and post-closure requirements. The **No Action, Institutional Action** and **InSitu-1** alternatives do not provide for any activities that could constitute closure or post-closure under the regulations.

*Long-Term Effectiveness and Permanence:*

Under the **No Action** alternative, residual risks from soil contaminants will remain. Therefore, they would not provide overall protection from exposures to human receptors and therefore will not provide long-term effectiveness. Under the **Institutional Action** and **InSitu-1** alternatives, while access to contaminated material will be controlled, over time migration of contaminants may occur. The **Institutional Action** and **InSitu-1**, while exhibiting greater effectiveness than the **No Action** alternative, still only achieve a moderate level of effectiveness.

The **SC-1, SC-2, OnSite-1** and **OnSite-2** alternatives soil will provide long-term effectiveness in protecting from exposure to human receptors. The **SC-1** and **SC-2** caps must be maintained and monitored to ensure continued protection; the **OnSite-1** and **OnSite-2** treatment alternatives are effectively permanent.

*Reduction of Toxicity, Mobility and Volume through Treatment:*

The **No Action, Institutional Action, InSitu-1, SC-1** and **SC-2** alternatives do not utilize treatment and therefore provide no reduction of toxicity, mobility and volume through treatment. The **OnSite-1** and **OnSite-2** alternatives do utilize treatment and would result in permanent reduction of toxicity, mobility and volume through treatment

*Short-Term Effectiveness:*

For all of the alternatives except **No Action**, with standard control measures (dust control, air monitoring) none of the alternatives will cause increases of short-term risk to the community or workers. The environmental impacts to natural habitats from the implementation of these alternatives range from: no impact (**No Action**); temporary and relatively minor impacts (**Institutional Action** and **InSitu-1**); and greater impacts (**SC-1, SC-2, OnSite-1** and **OnSite-2**) due to ground disturbance and excavation.

The time until Remedial Action Objectives are achieved varies considerably. The **No Action, Institutional Action** and **InSitu-1** alternatives are expected to take greater than 30 years. The **SC-1, SC-2, OnSite-1** and **OnSite-2** alternatives are expected to take 2 years.

*Implementability:*

Implementability is primarily related to three factors: technical feasibility (*i.e.*, can it be constructed, is it reliable); administrative feasibility; and the availability of services and materials to implement the remedy. First, all of the alternatives are feasible to implement. The **No Action, Institutional Action** and **InSitu-1** alternatives would each take little effort to implement; the **SC-1, SC-2, OnSite-1** and **OnSite-2** alternatives would require greater effort to implement. The **No Action** and **Institutional Action** alternatives are not considered reliable in achieving Remedial Action Objectives. The **SC-1, SC-2, OnSite-1** and **OnSite-2** alternatives are considered reliable in achieving Remedial Action Objectives, and the **InSitu-1** alternative is considered slightly reliably in achieving Remedial Action Objectives. Second, all of the alternatives are considered administratively feasible. Third, services and materials are available for implementation of all alternatives; services for the **OnSite-1** and **OnSite-2** alternatives are somewhat less commonly available.

*Cost:*

| | |
|---|---|
| No-Action | $0 (there will be a slight incremental cost associated with site wide Five-Year Review) |
| Institutional Action | $ 0.85 million |
| InSitu-1 | $ 0.90 million |
| SC-1 | $ 2.11 million |
| SC-2 | $ 5.61 million |
| OnSite-1 | $16.22 million |
| OnSite-2 | $21.18 million |

**V. Contaminated Soils Area.** The only media of concern being addressed is soil with potential human health risk (from lead) and source control of contaminants to prevent migration into groundwater. Table 7-9 presents a summary of the primary evaluation factors and a comparative assessment of the technologies/process options evaluated for AOC #5, Contaminated Soils Area which encompasses approximately 6.7 acres (the area in need of remediation). The technologies/process options for cleanup of soil include:

- **No Action** Subject to a review at least every five years as required by CERCLA since wastes would be left in place;
- **Inst. Action:** Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures) as well as monitoring;
- **InSitu-1:** In-situ remedy of monitored natural attenuation and institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures);
- **InSitu-2:** In-situ remedy consisting of solidification/stabilization and access restrictions (*i.e.*, land use restrictions) as well as monitoring;
- **InSitu-3:** In-situ remedy consisting of soil flushing, enhanced biodegradation, and access restrictions (*i.e.*, land use restrictions) as well as monitoring;
- **SC-1:** Source control remedy consisting of horizontal containment (*i.e.*, cap), institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures) as well as monitoring.
- **Off Site:** Remedy consisting of soil excavation and off site treatment/disposal;
- **OnSite-1:** Remedy consisting of soil excavation and on-site treatment via solidification/stabilization;
- **OnSite-2:** Remedy consisting of soil excavation and on-site treatment via soil washing/chemical extraction.

Analysis of Nine Criteria

*Overall Protection of Human Health and the Environment:*

The **No Action** alternative will not be protective of human health or the environment as it does not significantly reduce or eliminate potential exposures to human receptors, nor does it prevent contaminant migration to groundwater. The **Institutional Action** and **InSitu-1** alternatives will be somewhat more protective in that access (and exposure) to contaminated material will be controlled, but migration of contaminants into groundwater would not be addressed. The **InSitu-2, InSitu-3, SC-1, Off Site, OnSite-1** and **OnSite-2** alternatives will provide overall protection of human health by effectively reducing or eliminating potential exposure to soil and dust and will prevent migration of contaminants into groundwater. There are no ecological risks due to soil at this area.

*Compliance with ARARs:*

The **InSitu-2, InSitu-3,** will meet treatment standards by treating contaminated material to eliminate risks from contact and migration to groundwater. The **Off Site, OnSite-1** and **OnSite-2** alternatives will excavate contaminated soil for treatment or off-site disposal eliminating the risks.

The **SC-1** alternative will meet closure requirements by providing a barrier to prevent contact and ingestion of contaminated soil thereby eliminating the risk. Post-closure requirements will be met through monitoring and inspections. The **No Action**, **Institutional Action** and **InSitu-1** alternatives would not meet closure and post-closure requirements, because they do not provide for any activities that could constitute closure or post-closure under the regulations.

*Long-Term Effectiveness and Permanence:*

Under the **No Action** alternative residual risks from soil contaminants will remain. Therefore, they would not provide overall protection from exposures to human receptors nor prevent migration of contaminants into groundwater and therefore will not provide long-term effectiveness. Under the **Institutional Action** and **InSitu-1** alternatives, while access to contaminated material will be controlled, over time migration of contaminants may occur. Therefore, they would not provide overall protection from exposure to human receptors and will not provide long-term effectiveness.

The **InSitu-2, InSitu-3, SC-1, Off Site, OnSite-1** and **OnSite-2** alternatives will provide long-term effectiveness in protecting human receptors from exposure to contaminated soil and will prevent migration of contaminants into groundwater. The **SC-1** cap must be maintained and monitored to ensure continued protection; the **OnSite-1** and **OnSite-2** treatment alternatives are effectively permanent.

*Reduction of Toxicity, Mobility and Volume through Treatment:*

The **No Action, Institutional Action, InSitu-1**, and SC-1 alternatives do not utilize treatment and therefore provide no reduction of toxicity, mobility and volume through treatment. The **InSitu-2, InSitu-3, Off Site, OnSite-1** and **OnSite-2** alternatives do utilize treatment; the **InSitu-2, InSitu-3, Off Site, OnSite-1** and **OnSite-2** alternatives provide the greatest degree of expected reduction of toxicity, mobility and with the exception of the **InSitu-2** alternative, volume through treatment. While the **InSitu-2** alternative provides treatment, the solidification/stabilization treatment process is accompanied by a potentially significant increase in volume.

*Short-Term Effectiveness:*

For all of the alternatives except **No Action**, with standard control measures (dust control, air monitoring) none of the alternatives will cause increases of short-term risk to the community or workers. The environmental impacts to natural habitats from the implementation of these alternatives, range from: no impact (**No Action**); temporary and relatively minor impacts (**Institutional Action** and **InSitu-1**); and greater impacts (**InSitu-2, InSitu-3, SC-1, Off Site, OnSite-1** and **OnSite-2**) due to ground disturbance and excavation.

The time until Remedial Action Objectives are achieved varies considerably. The **No Action, Institutional Action** and **InSitu-1** alternatives are expected to take greater than 30 years. The **InSitu-2, InSitu-3, SC-1, Off Site, OnSite-1** and **OnSite-2** alternatives are expected to take 2 years.

*Implementability:*

Implementability is primarily related to three factors: technical feasibility (*i.e.*, can it be constructed, is it reliable); administrative feasibility; and the availability of services and materials to implement the remedy. First, all of the alternatives are feasible to implement. The **No Action, Institutional Action** and **InSitu-1** alternatives would each take little effort to implement; the **InSitu-2, InSitu-3, SC-1, Off Site, OnSite-1** and **OnSite-2** alternatives would require a greater effort to implement, since the AOC is within an active rail yard. The **No Action** and **Institutional Action** alternatives are not considered reliable in achieving Remedial Action Objectives. The **InSitu-2, InSitu-3, SC-1, Off Site, OnSite-1** and **OnSite-2** alternatives are considered reliable in achieving Remedial Action Objectives, with the **InSitu-2** alternative potentially less reliable. The **InSitu-1** alternative is considered moderately slightly reliable in achieving Remedial Action Objectives. Second, all of the alternatives are considered administratively feasible. Third, services and materials are available for implementation of all alternatives; services for the **InSitu-2, InSitu-3, OnSite-1** and **OnSite-2** alternatives are somewhat less commonly available.

*Cost:*

| | |
|---|---|
| No-Action | $0 (there will be a slight incremental cost associated with site wide Five-Year Review) |
| Institutional Action | $ 1.54 million |
| InSitu-1 | $ 1.58 million |
| InSitu-2 | $ 2.25 million |
| InSitu-3 | $10.23 million |
| SC-1 | $ 2.40 million |
| Off Site | $ 7.83 million |
| OnSite-1 | $ 8.20 million |
| OnSite-2 | $11.59 million |

**VI. Asbestos Landfill.** The media of concern was soil with the potential for human health risk (from asbestos). As the Asbestos Landfill had previously been capped, only maintenance activities were considered. Table 7-11 presents a summary of the primary evaluation factors and a comparative assessment of the technologies/process options evaluated for AOC #6, Asbestos Landfill which encompasses 13.3 acres. The options for cleanup of soil include:

- **No Action** Subject to a review at least every five years as required by CERCLA since wastes would be left in place;
- **Inst. Action:** Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures) as well as monitoring and maintenance of the existing cap.

Analysis of Nine Criteria

*Overall Protection of Human Health and the Environment:*

As long as the existing cap is maintained, it will remain protective of human health. Therefore, both the **No Action** and **Institutional Action** alternatives would be protective. However, the lack of maintenance would eventually cause the **No Action** alternative to be unprotective.

*Compliance with ARARs:*

Requirements related to the disturbance and handling of asbestos containing materials are the most significant for this area. Under the **Institutional Action**, activities(*i.e.*, fence installation) that may impact wetlands must be conducted in such a way as to minimize wetland impacts in order to meet associated requirements. The cap will be maintained to satisfy asbestos capping requirements under the **Institutional Action**, but not under the **No Action** alternative.

*Long-Term Effectiveness and Permanence:*

Under the **Institutional Action**, but not under the **No Action** alternative, with continued maintenance of the existing cap, there will be no risk to human receptors due to potential exposure to asbestos.

*Reduction of Toxicity, Mobility and Volume through Treatment:*

Neither alternative utilizes treatment processes and therefore provide no reduction of toxicity, mobility and volume through treatment.

*Short-Term Effectiveness:*

The **Institutional Action** alternative will be accompanied by a nominal increase of potential short-term risk of exposure, due primarily to soil disturbance for fence installation. Air monitoring and engineering controls to control dust will be required to manage potential risk from inhalation.

*Implementability:*

Implementability is primarily related to three factors: technical feasibility (*i.e.*, can it be constructed, is it reliable); administrative feasibility; and the availability of services and materials to implement the remedy. Both alternatives are technically and administratively feasible to implement. Services and materials for the alternatives are available.

*Cost:*

| | |
|---|---|
| No-Action | $0 (there will be a slight incremental cost associated with site wide Five-Year Review) |
| Institutional Action (including monitoring and maintaining the cap) | $ 1.31 million |

**VII. Asbestos Lagoons.** The media of concern being addressed is soil with the potential for human health risk (from asbestos) and source control of contaminants in the lagoon sediment to protect groundwater. Table 7-13 presents a summary of the primary evaluation factors and a comparative assessment of the technologies/process options evaluated for AOC #7, Asbestos Lagoons which encompass 1.9 acres. The technologies/process options for soil cleanup include:

- **No Action** Subject to a review at least every five years as required by CERCLA since wastes would be left in place;
- **Inst. Action:** Institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures) as well as monitoring;
- **SC-1:** Source control remedy consisting of horizontal containment (*i.e.*, cap), institutional actions consisting of access restrictions (*i.e.*, land use restrictions, fencing and security measures) as well as monitoring;
- **SC-2:** Source control remedy consisting of soil excavation and placement under caps at other on-site AOCs.

<u>Analysis of Nine Criteria</u>

*Overall Protection of Human Health and the Environment:*

The **No Action** alternative will not be protective of human health or the environment as it does not significantly reduce or eliminate potential exposure of human receptors to soil nor does it prevent migration of contaminants into groundwater. The **Institutional Action** alternative will be somewhat more protective in that access (and exposure) to contaminated material will be controlled, but migration of contaminants into groundwater would not be addressed. The **SC-1** and **SC-2** alternatives will provide overall protection of human health by effectively reducing or eliminating potential exposure of human receptors to soil and preventing the migration of contaminants into groundwater.

*Compliance with ARARs:*

Requirements related to the disturbance and handling of asbestos containing materials and the closure/post closure of waste facilities are the most significant for this area. The **SC-1** and **SC-2** alternatives would achieve these requirements. **No Action** and **Institutional Action** do not provide for any activities that would meet these requirements, nor would they meet closure/post closure standards.

*Long-Term Effectiveness and Permanence:*

The **No Action** and **Institutional Action** alternatives will allow residual risks to remain at unacceptable levels. The **SC-1** and **SC-2** alternatives will provide long-term effectiveness in protecting from exposure of human receptors to asbestos containing material and prevent the migration of contaminants into groundwater. Cap maintenance and monitoring will be necessary to ensure continued effectiveness.

*Reduction of Toxicity, Mobility and Volume through Treatment:*

None of the considered alternatives utilize treatment processes and therefore provide no reduction of toxicity, mobility and volume through treatment.

*Short-Term Effectiveness:*

The **Institutional Action** alternative will be accompanied by a nominal increase of potential short-term risk of exposure, due primarily to soil disturbance for fence installation. Air monitoring and engineering controls to control dust will be required to manage potential risk from inhalation. The **SC-1** and **SC-2** alternatives will be accompanied by a somewhat greater potential short-term risk of exposure, due to capping and the handling of asbestos containing material which is necessary in these alternatives. As alternative **SC-2** involves transport of material to another AOC, short term risks (from asbestos material becoming airborne) are potentially greater than for **SC-1.** Air monitoring, dust control/suppression measures will be employed, and workers will wear necessary protective equipment.

*Implementability:*

Implementability is primarily related to three factors: technical feasibility (*i.e.*, can it be constructed, is it reliable); administrative feasibility; and the availability of services and materials to implement the remedy. These alternatives are all technically and administratively feasible to implement. Services and materials for the alternatives are available.

*Cost:*

| | |
|---|---|
| No-Action | $0 (there will be a slight incremental cost associated with site wide Five-Year Review) |
| Institutional Action | $ 0.85 million |
| SC-1 | $ 2.90 million |
| SC-2 | $ 1.97 million |

## L. THE SELECTED REMEDY

1. Summary of the Rationale for the Selected Remedy

The selected remedy is a combination of individual source control remedies which addresses risks associated with the seven Areas of Concern (AOCs) at Operable Unit 3 (OU3) of Iron Horse Park.

The capping components of the remedy will prevent direct contact with contaminants by human and ecological receptors. In addition these components will help prevent migration of contaminants to groundwater and surface water.

A source control remedy was chosen for implementation at each area of concern.

2. Description of Remedial Components

The selected remedy for the **B&M Railroad Landfill** involves:

- *excavating landfill material from the edge of the wetland to minimize impacts of the cleanup action;*

Install sheet piling along the edge of the wetland. Excavate waste material 5 feet deep and 50 feet wide along edge of wetland. Place excavated material on landfill

- *capping landfill material;*

Cap landfill: grade slopes, install: Double barrier cap (Region 1 Alternative Cap Design). An example of a cap utilizing the Region 1 Alternative Cap Design, would include installation of: soil sub-grade layer; suitable gas vent layer; low-permeability soil layer (<10-4 cm/sec) ≥12 inches; 60 mil low-density polyethylene membrane liner; drainage layer; 24 inch cover soil layer; 6 inch topsoil layer and hydro-seed(Figure L-1). In addition, storm-water drainage structures (swales, rip-rap, perimeter drains), detention basins and gas vents, as necessary.

- *erecting a fence around the landfill;*

Install fence to prevent unauthorized access in order to safeguard the public, and prevent damage to landfill structures.

- *instituting land use restrictions;*

Restrict activities (like excavation and construction) which may damage the landfill cap and cause exposure to and migration of landfill contaminants. To be implemented by responsible parties.

- *restoring wetlands impacted by the cleanup;*

Install wetland soils and replant with appropriate species as necessary. The limits of the wetland restoration will be determined during remedial design.

- *inspecting & maintaining the landfill cap & fence on a periodic basis to ensure that it remains effective;*

Maintenance program to inspect landfill structures and maintain/repair as necessary.

- *sampling groundwater periodically to assess the effects of the source control action (capping)& any ongoing impacts from the landfill. Installing, if necessary, new monitoring wells.*

Monitor groundwater quality downgradient of landfill

The selected remedy for the **RSI Landfill** involves:

- *capping landfill material;*

Cap landfill: grade slopes, install: Single barrier - Subtitle D - Solid Waste cap. An example of a Subtitle D - Solid Waste cap would include installation of: soil sub-grade layer; suitable gas vent layer; 60 mil low-density polyethylene membrane liner; drainage layer; 24 inch cover soil layer; 6 inch topsoil layer and hydro-seed(Figure L-2). In addition, storm-water drainage structures (swales, rip-rap, perimeter drains), detention basins and gas vents, as necessary.

- *erecting a fence around the landfill;*

Install fence to prevent unauthorized access in order to safeguard the public, and prevent damage to landfill structures.

- *instituting land use restrictions;*

Restrict activities (like excavation and construction) which may damage the landfill cap and cause exposure to and migration of landfill contaminants. To be implemented by responsible parties.

- *inspecting & maintaining the landfill cap & fence on a periodic basis to ensure that it remains effective;*

Maintenance program to inspect landfill structures and maintain/repair as necessary.

- *sampling groundwater periodically to assess the effects of the source control action (capping)& any ongoing impacts from the landfill. Installing, if necessary, new monitoring wells.*

Monitor groundwater quality downgradient of landfill

The selected remedy for the **B&M Locomotive Shop Disposal Areas** involves:

- *capping disposal area;*

Cap disposal area: Grade slopes, install: Single barrier - Subtitle D - Solid Waste cap. An example of a Subtitle D - Solid Waste cap would include installation of: soil sub-grade layer; suitable gas vent layer; 60 mil low-density polyethylene membrane liner; drainage layer; 24 inch cover soil layer; 6 inch topsoil layer and hydro-seed(Figure L-2). In addition, storm-water drainage structures (swales, rip-rap, perimeter drains), detention basins and gas vents, as necessary.

- *erecting a fence around the landfill;*

Install fence to prevent unauthorized access in order to safeguard the public, and prevent damage to landfill structures.

- *instituting land use restrictions;*

Restrict activities (like excavation and construction) which may damage the landfill cap and cause exposure to and migration of landfill contaminants. To be implemented by responsible parties.

- *restoring wetlands impacted by the cleanup;*

Install wetland soils and replant with appropriate species as necessary.

- *inspecting & maintaining the landfill cap & fencing on a periodic basis to ensure that it remains effective;*

Maintenance program to inspect landfill structures and maintain/repair as necessary.

- *sampling groundwater periodically to assess the effects of the source control action (capping)& any ongoing impacts from the landfill. Installing, if necessary, new monitoring wells.*

Monitor groundwater quality downgradient of landfill

The selected remedy for the **Old B&M Oil/Sludge Recycling Area** involves:

- *capping contaminated soils with a gravel/asphalt barrier (final area to be capped will be determined via a pre-design study);*

Cap area with a gravel/asphalt barrier based on relevant and appropriate Subtitle D Solid Waste capping standards (final area to be capped will be determined via a pre-design study - assumed to be 7 acres). An example of relevant and appropriate Subtitle D Solid Waste capping standards would include installing gravel sub-grade layer as necessary, bituminous concrete intermediate course and bituminous concrete top course (Figure L-3)

- *instituting land use restrictions;*

Restrict activities (excavation and construction) which may damage the cap and permit exposure to contaminated material. To be implemented by responsible parties.

- *sampling groundwater periodically to assess the effects of the source control action (capping). Installing, if necessary, new monitoring wells.*

Monitor downgradient groundwater quality

The selected remedy for the **Contaminated Soils Area** involves:

- *capping contaminated soils;*

Cap area with a gravel/asphalt barrier based on relevant and appropriate Subtitle D Solid Waste capping standards. An example of relevant and appropriate Subtitle D Solid Waste capping standards would include installing a gravel sub-grade layer, bituminous concrete intermediate course and bituminous concrete top course(Figure L-3). Special care will be required to conduct capping activities in rail yard areas;

- *instituting land use restrictions;*

Restrict activities (excavation and construction) which may damage the cap and permit exposure to contaminated material. To be implemented by responsible parties.

- *sampling groundwater periodically to assess the effects of the source control action (capping). Installing, if necessary, new monitoring wells.*

Monitor downgradient groundwater quality

The selected remedy for the **Asbestos Landfill** involves:

- *inspecting & maintaining the existing gravel & vegetated soil cap to ensure asbestos material does not become airborne;*

Maintenance program to inspect existing landfill structures and maintain/repair as necessary.

- *erecting & maintaining a fence around the landfill;*

Install fence to prevent unauthorized access in order to safeguard the public, and prevent damage to landfill structures.

- *instituting land use restrictions;*

Restrict activities (like excavation and construction, residential use) which may damage the landfill cap and cause exposure to and migration of landfill contaminants(asbestos). To be implemented by responsible parties.

- *sampling groundwater periodically to assess the effects of the source control action (capping)& any ongoing impacts from the landfill Installing, if necessary, new monitoring wells.*

Monitor downgradient groundwater quality

The selected remedy for the **Asbestos Lagoons** involves:

- *capping lagoon material;*

Cap lagoons: define limits of contamination, including potential satellite deposits, grade slopes/berms, install: soil/fill if necessary for subgrade; Single barrier - Subtitle D - Solid Waste cap. An example of a Subtitle D - Solid Waste cap would include installation of: soil sub-grade layer; suitable gas vent layer; 60 mil low-density polyethylene membrane liner; drainage layer; 24 inch cover soil layer; 6 inch topsoil layer and hydro-seed(Figure L-2). In addition, storm-water drainage structures (swales, rip-rap, perimeter drains), detention basins, as necessary.

- *erecting a fence around the capped material;*

Install fence to prevent unauthorized access in order to safeguard the public, and prevent damage to cap structures.

- *instituting land use restrictions;*

Restrict activities (like excavation and construction, residential use) which may damage the cap and cause exposure to and migration of capped contaminants. To be implemented by responsible parties.

- *inspecting & maintaining the cap & fence on a periodic basis to ensure that it remains effective;*

Maintenance program to inspect cap structures and maintain/repair as necessary.

- *sampling groundwater periodically to assess the effects of the source control action (capping)&*

*any ongoing impacts from the landfill. Installing, if necessary, new monitoring wells.* Monitor groundwater quality downgradient of lagoons.

The ground water monitoring system will be utilized to collect information semi-annually regarding groundwater quality down gradient of individual source areas to help assess the effectiveness of the source control remedies.

Hazardous substances, pollutants or contaminants already remain at the Site due to previous actions (OU2 Shaffer Landfill closure). Because of this, EPA has and will continue to review the Iron Horse Park Site at least once every five years to assure that the implemented remedial actions continue to protect human health and the environment. The most recent Five-Year Review was completed by EPA in September 2003. The next review will be required by September 2008.

The selected remedy may change somewhat as a result of the remedial design and construction processes. Changes to the remedy described in this Record of Decision will be documented in a technical memorandum in the Administrative Record for the Site, an Explanation of Significant Differences ("ESD") or a Record of Decision Amendment, as appropriate.

3. Summary of the Estimated Remedy Costs

See Tables L-1 thru L-7 for a summary of Estimated Remedy Costs by AOC.

The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

The total estimated cost of the selected remedy for all AOCs is $23.53 million.

4. Expected Outcomes of the Selected Remedy

An expected outcome of the selected remedy is that the **B&M Locomotive Shop Disposal Areas, the Old B&M Oil/Sludge Recycling Area** and the **Contaminated Soils Area** will no longer present an unacceptable risk to human health via ingestion. Another expected outcome of the selected remedy is that the **Asbestos Landfill** and the **Asbestos Lagoons** will no longer present a potential human health risk via inhalation of asbestos. Another expected outcome is that the **B&M Landfill** and the **B&M Locomotive Shop Disposal Area** will no longer present an unacceptable environmental risk via ingestion and direct contact. An additional expected outcome is the source control actions, specifically capping, removing the **B&M Landfill**, the **RSI Landfill**, the **B&M Locomotive Shop Disposal Areas**, the **Old B&M Oil/Sludge Recycling Area**, the **Contaminated Soils Area**, and the **Asbestos Lagoons** as source areas and ongoing contributors of contamination to local groundwater.

The selected remedy will also provide environmental and ecological benefits such as preventing further negative impacts from the **B&M Landfill** and the **B&M Locomotive Shop Disposal Area** on adjacent wetlands.

a. Soil Cleanup Levels

The current and anticipated future use of the Site is industrial. The Site is zoned industrial with the industrial zoning extending somewhat beyond the site limits. The Middlesex Canal,, which flows through the Site, is essentially impassible for recreational or economic purposes. The Middlesex Canal is listed on the National Register of Historic Places. Current landowners and operating companies at the Iron Horse Industrial Park include: B&M Corporation, MBTA, General Latex, Penn Culvert (most recently Cooperative Reserve Supply), Spincraft, Wood Fabricators, BNZ Materials, and Eastern Terminals, Inc. The Purity Supreme warehouse abuts the Site to the south. The area within one mile of the Site is primarily forested and residential, with "rural residential" being the predominant zoning category.

A soil cleanup level for lead was developed to protect a current female site worker of child-bearing age. The cleanup level is based on the methodology described in *Interim Approach to Assessing Risk Associated with Adult Exposures to Lead in Soil* (U.S. EPA, 1996). The cleanup level is based on the site-specific maternal blood level of 4.2 ug/dL, developed in the RI risk assessment as a level protective of a 95$^{th}$ percentile fetal blood lead level of 10 ug/dL. The lead cleanup level applies to the B&M Locomotive Shop Disposal Areas, Old B&M Oil/Sludge Recycling Area, and Contaminated Soils Area.

**Table CL-1** summarizes the cleanup level for lead in soils.

**Table CL-1: Soil Cleanup Levels for the Protection of Human Receptors**

| Non-Carcinogenic Compounds of Concern | Target Endpoint | Soil Cleanup Level (mg/kg) | Basis | RME Hazard Quotient |
|---|---|---|---|---|
| Lead | Central Nervous System | 1,736 | Adult Lead Model | N/A |

Development of soil cleanup levels for ecological receptors was based on shrew endpoints to emphasize the importance of contamination in the food chain and risk to the small mammal community. Risks were identified for exposures of shrew to high concentrations of cadmium in soil at the B&M Railroad Landfill and to copper and lead in soils at the B&M Locomotive Shop Disposal Areas.

Cleanup levels were developed to identify a soil concentration at which ecological effects are likely to occur. The cleanup levels are based on a daily dose resulting in a hazard quotient (HQ) of 1.0, and using a protective NOAEL TRV. Since food COC concentrations were estimated from soil concentrations, the food chain models were used to back-calculate a soil concentration that corresponds to a daily dose resulting in an HQ of 1.0. This approach assumes that concentrations are evenly distributed throughout the site or foraging area. Cleanup levels are summarized below (Table CL-2) for those COCs identified as posing risk to small terrestrial mammals. The cleanup levels are based on modeling of receptor dietary doses from soil concentrations.

**Table CL-2: Soil Cleanup Levels for the Protection of Ecological Receptors**

| AOC | Compounds of Concern | Soil Cleanup Level (mg/kg) | Basis | Assessment Endpoint |
|---|---|---|---|---|
| B&M Railroad Landfill | Cadmium | 15.4 | Food chain models, NOAEL | Sustainability (survival, growth, reproduction) of local populations of small terrestrial mammals |
| B&M Locomotive Shop Disposal Areas | Copper | 2,213 | Food chain models, NOAEL | Sustainability (survival, growth, reproduction) of local populations of small terrestrial mammals |
| | Lead | 868 | Food chain models, NOAEL | Sustainability (survival, growth, reproduction) of local populations of small terrestrial mammals |

These soil cleanup levels must be met at the completion of the remedial action at the points of compliance. These soil cleanup levels attain EPA's risk management goal for remedial actions and have been determined by EPA to be protective.

b. Soil - Source Control

A significant component of the Iron Horse Park OU3 Remedy involves source control actions. The source control actions at the **B&M Landfill**, the **RSI Landfill**, the **B&M Locomotive Shop Disposal Areas,** the **Old B&M Oil/Sludge Recycling Area,** the **Contaminated Soils Area** and the **Asbestos Lagoons** have two purposes. One purpose is to prevent exposure to contaminated material (metals or asbestos). Another purpose is to prevent the migration of contaminants from soil to groundwater. At these AOCs there are many instances of a particular contaminant being present in both soil(surface or sub-surface) and in downgradient groundwater. At the **B&M Landfill**, toluene, xylenes, arsenic, manganese, lead, barium, chromium, vanadium and zinc are present in both media. At the **RSI Landfill**, chlorobenzene, 1,2 dichloroethene, arsenic, manganese, barium and lead are present in both media. At the **B&M Locomotive Shop Disposal Areas**, arsenic, manganese, barium, copper, lead and zinc are present in both media. At the **Old B&M Oil/Sludge Recycling Area,** arsenic, manganese, lead, barium, cobalt, chromium and vanadium are present in both media. At the **Contaminated Soils Area,** arsenic, manganese, copper and zinc are present in both media. At the **Asbestos Lagoons**, xylenes, arsenic, manganese, barium, lead, chromium and zinc are present in both sediment (i.e. the solid material within the lagoons which was sampled) and downgradient groundwater. The occurrence of contaminants will be evaluated for inclusion in post-closure monitoring, in order to evaluate the effectiveness of the source control actions at these AOCs in preventing migration of contaminants to groundwater.

c. Soil - Asbestos

Trespassers and workers potentially may be chronically exposed to asbestos fibers released from the Asbestos Lagoons as well as at the Asbestos Landfill, if the landfill cap is not maintained.

Effects on the lung resulting from inhalation of asbestos fibers is the major asbestos health concern. Chronic inhalation exposure to asbestos can result in a lung disease termed asbestosis which is characterized by shortness of breath and cough. Asbestosis may lead to severe impairment of respiratory function and ultimately death. Other effects include scarring of tissue surrounding the lungs. pulmonary hypertension and immunological effects. Inhalation of asbestos fibers can cause lung cancer and mesothelioma (a rare cancer of the thin membranes lining the abdominal cavity and surrounding internal organs).

Asbestos fibers in the Lagoons, have the potential to become airborne, posing a human health threat via the inhalation pathway. Disposal of asbestos in these lagoons as well as subsequent partial removal has been documented. Furthermore, sampling of material in the lagoons confirms the presence of asbestos.

Under the National Emissions Standards for Hazardous Air Pollutants (NESHAP), in 1973 EPA defined asbestos containing material as material containing 1% asbestos or greater based detection limits available at the time. More recent data demonstrates that materials containing less than 1% asbestos may also pose a potential health risk in some circumstances.

## M. STATUTORY DETERMINATIONS

The remedial action selected for implementation at the Iron Horse Park OU3 Site is consistent with CERCLA and, to the extent practicable, the NCP. The selected remedy is protective of human health and the environment, will comply with ARARs and is cost effective. In addition, the selected remedy utilizes permanent solutions and alternate treatment technologies or resource recovery technologies to the maximum extent practicable, and satisfies the statutory preference for treatment that permanently and significantly reduces the mobility, toxicity or volume of hazardous substances as a principal element.

1. The Selected Remedy is Protective of Human Health and the Environment

The remedy at this Site will adequately protect human health and the environment by eliminating, reducing or controlling exposures to human and environmental receptors through engineering controls and institutional controls. More specifically capping of contaminated material, maintenance of an existing cap, fencing and land use restrictions will control and eliminate potential risks posed by Operable Unit 3 of Iron Horse Park. Capping will prevent direct contact with contaminated material. Capping and maintenance of an existing cap will prevent asbestos from becoming airborne. Capping will prevent migration of contaminants into groundwater. Fencing and land use restrictions, will ensure that remedial measures are preserved and continue to prevent exposure and further releases.

The selected remedy will reduce potential human health risk levels such that the non-carcinogenic hazard is below a level of concern. It will reduce potential human health risk levels to protective ARARs levels, i.e., the remedy will comply with ARARs and To Be Considered criteria. The selected remedy will control ecological risk by eliminating direct contact with and ingestion of contaminants above acceptable ecological risk levels in soil and preventing migration of contaminants into surface waters. Implementation of the selected remedy will not pose any unacceptable short-term risks or cause any cross-media impacts.

The selected response action addresses low-level threat wastes at the site by: eliminating exposure to human and ecological receptors from contaminated soil and airborne asbestos. This is accomplished through source control actions at the affected AOCs (capping of landfills and contaminated soil areas). In addition, the source control actions will help eliminate the ongoing migration of contaminants from the source areas to groundwater or surface water. Long term monitoring/maintenance and institutional controls will ensure that the remedy remains protective in the future. There are no principal threat wastes at OU3.

2. The Selected Remedy Complies With ARARs

The selected remedy, consisting of capping six of the AOCs and maintaining a cap previously constructed at the seventh AOC, will comply with all federal and any more stringent state ARARs that pertain to the Site (see Tables L-8 thru L-14). Federal ARARs, and the AOC's they apply to, are:

1. **Resource Conservation and Recovery Act -** B & M Landfill (closure/post closure and floodplain standards); All AOCs except the Asbestos Landfill (waste characterization)
2. **Toxic Substances Control Act -** Asbestos Landfill and Asbestos Lagoons
3. **Clean Water Act -** B & M Landfill, RSI Landfill, B & M Disposal Areas, Asbestos Landfill
4. **Executive Order 11988 (Floodplain Management) -** B & M Landfill
5. **Executive Order 11990 (Protection of Wetlands) -** B & M Landfill, RSI Landfill, B & M Disposal Areas, Asbestos Landfill
6. **Fish & Wildlife Coordination Act -** B & M Landfill, RSI Landfill, B & M Disposal Areas, Asbestos Landfill
7. **National Historic Preservation Act -** B & M Landfill and RSI Landfill
8. **Historic Sites Act -** B & M Landfill and RSI Landfill
9. **Clean Air Act, National Emission Standard for Asbestos, Subpart M -** Asbestos Landfill and Asbestos Lagoons

The ARARs for each AOC vary depending on the type of cap required (TSCA, hazardous waste, or solid waste); the location of the AOC relative to wetlands, floodplains, and historic structures; the contaminants present (including, but not limited to asbestos, lead); and whether the AOC is a source control remedy or not (see Tables L-8 thru L-14). RCRA Land Ban requirements (40 C.F.R. Part 268) are not ARARs at this Site.

In addition, the selected remedies for each AOC will comply with the following more stringent state ARARs that are described in more detail in Tables L-8 thru L-14:

1. **Massachusetts Solid Waste Management Regulations** - All AOCs except B & M Landfill and Asbestos Landfill
2. **Massachusetts Hazardous Waste Management Regulations** - B & M Landfill (capping standards); All AOCs except the Asbestos Landfill (waste characterization)
3. **Massachusetts Clean Waters Act** - B & M Landfill, RSI Landfill, B & M Disposal Areas, Asbestos Landfill
4. **Massachusetts Wetlands Protection Act** - All AOCs
5. **Massachusetts Antiquities Act and Regulations** - B & M Landfill and RSI Landfill
6. **Massachusetts Air Pollution Control Regulations** - All AOCs

The specific State ARARs for each selected remedy for each of the seven AOC are listed in Tables L-8 thru L-14 and, as with the federal ARARs, they vary based on the type of cap required (hazardous waste or solid waste); the location of the AOC relative to wetlands, floodplains, and historic structures; the contaminants present (including, but not limited to asbestos, lead); and whether the AOC is a source control remedy or not

The following policies, advisories, criteria, and guidances (TBCs) were also be considered for each selected remedy for each of the seven AOCs listed in Tables L-8 thru L-14. The TBCs pertain either to assessing risk or to providing guidance on capping standards.

1. **Clarifying Cleanup Goals and Identification of New Assessment Tools for Evaluating Asbestos at Superfund Cleanups (EPA)** - Asbestos Lagoons and Asbestos Landfill
2. **Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposure to Lead in Soil (EPA)** - B & M Disposal Areas, B & M Oil/Sludge Recycling Area, Contaminated Soil Area
3. **EPA Cancer Slope Factors** - All AOCs, except the Asbestos Landfill
4. **EPA Reference Dose** - All AOCs except the Asbestos Landfill
5. **EPA Alternative Cap Guidance** - B & M Landfill
6. **Massachusetts DEP Landfill Technical Guidance Manual** - All AOCs except B & M Landfill and Asbestos Landfill

3. The Selected Remedy is Cost-Effective

In the Lead Agency's judgment, the selected remedy is cost-effective because the remedy's costs are proportional to its overall effectiveness (see 40 CFR 300.430(f)(1)(ii)(D)). This determination was made by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (i.e., that are protective of human health and the environment and comply with all federal and any more stringent ARARs, or as appropriate, waive ARARs). Overall effectiveness was evaluated by assessing three of the five balancing criteria -- long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness, in combination. The overall effectiveness of each alternative then was compared to the alternative's costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence represents a reasonable value for the money to be spent.

Tables 7-1, 7-3, 7-5, 7-7, 7-9, 7-11 and 7-13 help demonstrate the cost-effectiveness of the selected remedy. In general, the cost differences between different protective alternatives at each AOC are so extensive, and the increase in overall effectiveness (if any) is so modest, that the cost effectiveness of the selected remedy is self-evident. It should be noted that at the Contaminated Soils AOC, the selected remedy of capping appears to compare very closely with the in-situ solidification/stabilization alternative. In addition, the solidification/stabilization alternative utilizes treatment. However, this AOC is in the midst of the active rail yard at Iron Horse Park. The solidification/stabilization process has the potential for a significant volumetric increase (up to 50%) in material due to additives in the solidification/stabilization process. The rail yard with active tracks, is an area where this kind of additional volume would be very problematic due to impacts on the railroad tracks.

4. The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable

Once the Agency identified those alternatives that attain or, as appropriate, waive ARARs and that are protective of human health and the environment, EPA identified which alternative utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This determination was made by deciding which of the identified alternatives provide the best balance of trade-offs among alternatives in terms of: 1) long-term effectiveness and permanence; 2) reduction of toxicity, mobility or volume through treatment; 3) short-term effectiveness; 4) implementability; and 5) cost. The balancing test <u>emphasized</u> long-term effectiveness and permanence and the reduction of toxicity, mobility and volume through treatment; and <u>considered</u> the preference for treatment as a principal element, the bias against off-site land disposal of untreated waste, and community and state acceptance. The selected remedies provide the best balance of trade-offs among the alternatives.

Tables 7-1, 7-3, 7-5, 7-7, 7-9, 7-11 and 7-13 demonstrate how the respective selected remedies, provide the best balance of trade-offs when compared against the evaluation criteria. As discussed previously, the cost difference between different protective alternatives at each AOC is typically so extensive, and the increase in overall effectiveness (if any) is so modest, that even with the balance emphasis on reduction of toxicity, mobility and volume through treatment, the relative merits of the selected remedies are self-evident.

5. The Selected Remedy Does Not Satisfy the Preference for Treatment Which Permanently and Significantly Reduces the Toxicity, Mobility or Volume of the Hazardous Substances as a Principal Element

The principal element of the selected remedy at the various AOCs is source control by containment (capping). This element addresses the primary threat at the Site, contamination of soil and migration of soil contaminants into surface and groundwater. The remedy does not satisfy the statutory preference for treatment as a principal element. Treatment alternatives evaluated in the Feasibility Study were not practicable, primarily due to cost. At one AOC (the Contaminated Soils Area) a treatment alternative (in-situ solidification/stabilization) was impracticable due to implementability (volume increase of treated material in an area where an increase in volume would be problematic due to the area's use as an active rail yard).

6. Five-Year Reviews of the Selected Remedy are Required.

Because this remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure, a review will be conducted within five years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. In addition, Five-Year Reviews are already required for the entire Iron Horse Park Superfund Site due to the prior initiation of remedial action at Shaffer Landfill (OU2). The next Five-Year Review for Iron Horse Park is due in September 2008.

## N. DOCUMENTATION OF SIGNIFICANT CHANGES

The June 2004 Proposed Plan for Operable Unit 3 presented, for the **Asbestos Lagoons** AOC a source control remedy (SC-2) consisting of excavation of asbestos containing material for placement under the cap of a different on-site AOC. After further consideration, and upon receipt of public comment, EPA has determined to select a different alternative for the **Asbestos Lagoons** AOC , the source control remedy (SC-1) which consists of capping the material in place. Both alternatives were considered and evaluated during the Feasibility Study and were discussed in the Proposed Plan. Both alternatives are considered protective. The change will provide some benefit with regard to the Short-Term Effectiveness criteria, in that special provisions for handling and transporting asbestos containing material will be limited significantly. Comments made on behalf of the BNZ Materials, Inc, the owner of the property where the lagoons are located, also indicated a preference for capping and managing the material within the same property.

There are no other significant changes from the alternatives presented in the Proposed Plan.

## O. STATE ROLE

The Massachusetts Department of Environmental Protection (MADEP) has reviewed the various alternatives and has indicated its support for many components of the selected remedy as presented in the Proposed Plan. MADEP expressed concerns with the preferred alternatives at two AOC's. At one AOC (the Asbestos Lagoons) MADEP indicated concern over uncertainties related to the volume of material to be excavated for placement and capping at another AOC. However, EPA is selecting the alternative whereby the lagoon material will be capped in place (see Section N. Documentation of Significant Change, above). Because of this, excavation volume will no longer be a concern. The other AOC where MADEP expressed concern with the preferred alternative is the **B&M Locomotive Shop Disposal Areas**. MADEP expressed a preference for the alternative (SC-2) which calls for excavation of material and placement under the cap at another AOC, rather than capping in place (SC-1), as proposed. In its comments MADEP suggests that the volume of material that would need to be excavated and therefore the cost of the alternative, have been overestimated. The volume estimates were based on identifying areas of fill utilizing terrain conductivity and ground penetrating radar surveys. There is a good degree of confidence in the associated data, and therefore in the estimate of fill volume that would need to be excavated. While the volume estimates are undoubtedly not exact, they provide ample information to support a ROD cost estimate. Because of this, EPA does not feel that it is necessary to re-assess the cost estimate. An additional issue raised concerns potential negative impacts to wetlands from the capping in place alternative. Due to the proximity of wetlands to the **B&M Locomotive Shop Disposal Areas**, some wetland impacts are likely with either SC-1 or SC-2 alternatives. Normal construction safeguards, to minimize wetland impacts during construction, as well as provisions for wetland restoration/replication, will ensure that necessary wetland requirements are addressed.

The State has also reviewed the Remedial Investigation, Risk Assessment and Feasibility Study to determine if the selected remedy is in compliance with applicable or relevant and appropriate State environmental and facility siting laws and regulations. The Massachusetts Department of Environmental Protection concurs with the selected remedy for the Iron Horse Park OU3 Site. A copy of the declaration of concurrence is attached as Appendix A.